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Requirement of the Internship for Graduation*

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When Doctor Zapffe wrote me last spring and asked me to read a short paper about the fifth or hospital year, I remembered that I had long ago read a paper on the same subject at a meeting of the Association of American Medical Colleges. I replied that I would do so if for no other reason than that it amused me to talk again on the same subject I had discussed thirty-one years ago. As I do not believe anyone is here today, except Doctor Zapffe, who heard my first paper, I might read it again, as I feel today about this matter just as I did then. I understand that sermons are at times used over again. The meeting of the Association of American Medical Colleges I refer to was held in February, 1913. At that time the Bureau of Education and Licensure in Pennsylvania had announced that after January 1, 1914, a year of internship of candidates for licensure to practice in the State would be required. Pennsylvania was the first State to require the year of internship.

I felt then, as I do now, that the State should require the internship and not the school, if it is to be required at all. In 1913, the seven medical schools then in Pennsylvania all approved of this action taken by the Bureau. In my first paper, I mentioned that Harvard, Washington, Cornell, Hopkins and Virginia all felt that the degree of M.D. should be given at the end of the Fourth Year. A few schools at that time, among those to which I wrote, believed that the fifth or hospital year should be part of the medical curriculum.

In 1914, Minnesota, Stanford and Rush required the fifth year; the next year California, Northwestern and Vermont announced that they would require it. In 1924, ten schools were on the list; in 1928, eleven. In 1940 the following twelve schools in the United States required the intern year: California, College of Medical Evangelists, Southern California, Stanford, Loyola, Northwestern, Illinois, Wayne, Minnesota, Duke, Cincinnati, Marquette and four schools in Canada.

At present, only the following six schools in the United States withhold their diploma until the completion of the internship: College of Medical Evangelists, Southern California, Stanford, Northwestern, Minnesota and Duke.

* Read at the Fifty-fifth Annual Meeting of the Association of American Medical Colleges, held in Detroit, October 23-25, 1944.

Four schools in Canada require the fifth year. We see the growth has been a slow one and that the war has caused a reduction in the number of schools involved. In the past year there were 451 students in the United States and 150 in Canada, a total of 600, reported as completing the fifth or intern year in fulfillment of the internship requirement for the M.D. degree. Twenty-seven States now require an internship before granting a license, as does Alaska, District of Columbia, Hawaii and Puerto Rico.

In my early paper, I stated that at that time 90 per cent of the graduates of the University of Pennsylvania did serve an internship; that 10 per cent did not. However, during the past twenty years or so, 100 per cent of our graduates have served as interns although many of them went to States where an internship was not a requirement for licensure, as for example, in New York.

If, therefore, 100 per cent of a school's graduates serve as interns, I do not see any sufficient reason for withholding the degree until the completion of the internship. If a school finds that some of its graduates are not taking an internship but starting to practice in States where no internship requirement exists, then I can see reason for the school taking steps to insure that all its graduates be forced to add this very important training to their educational program. Perhaps, some schools feel that their graduates will serve in better hospitals if the school has an approved list of hospitals in which the graduates must serve in order to obtain their degree. My experience has been that our students want to get the best internships available and that it is only rarely that they voluntarily apply at a poor hospital. These occasional cases are usually due to a student wishing to go to a hospital in his home town where he wants to practice later. This is, at times, advisable.

I recall arguing thirty-one years ago with Dr. Dodson, then Dean of Rush Medical College, whether he could check up on his fifth year students serving in hospitals in distant parts of the United States. He maintained that through periodic reports from these hospitals he could tell if the intern was behaving himself, working hard and proving satisfactory. I said then, and I still feel that way, that I doubted it. Our April, 1943, class, numbering 131, went to 60 different hospitals for internships.

I certainly am glad I did not have to get reports from these 60 hospitals about those 131 interns. I have enough troubles these days without looking for more. I do not want to have to complain to some hospital at a distance about the service offered the interns and, perhaps, have to tell the hospital that it will not thereafter be on our approved list and we will not give credit toward our degree for the service there.

As I have said, the State of Pennsylvania required an internship for licensure in 1914 and I must confess that the Pennsylvania Bureau and I have not seen "eye to eye" on this intern question during these years. We have had many nice little scraps, but even if our school had required a fifth year we would not have avoided all of these rows and we might have had others.

Since 1914, the Pennsylvania Bureau has caused many hospitals in Pennsylvania to toe the mark and has, I believe, brought about more improvements in the internship service in Pennsylvania hospitals than the medical schools could have done through the requirement of a fifth year for graduation. Take, for example, the Pennsylvania Hospital, the oldest hospital in the United States; before 1914 it had no obstetrical service but when told by the Pennsylvania Bureau that the hospital in consequence was not on the approved list, the hospital merged with the old Philadelphia Lying-in Hospital and ever since the interns have had a splendid obstetrical service. If one or two of the Pennsylvania medical schools had required a fifth year, I doubt that these schools could have persuaded the Pennsylvania Hospital so promptly to make this needed change. I think the hospital would merely have obtained interns from other schools not requiring the fifth year.

Hospital internships have improved greatly and will continue to improve. The data collected each year by the American Medical Association about the hospitals, as has been done for years, has influenced hospitals to improve their intern services. Likewise, the States requiring an intern year before a license is granted have helped in this cause and I suppose the medical schools requiring the fifth year have also aided. The study of internships being carried on by a Committee of this Association will also have a beneficial effect, particularly when, as was planned, it becomes possible for members of the Committee to visit the hospitals in their region and discuss with the hospital authorities means of improving the intern services. This part of the work of the Committee has not yet started due to the war.

And so I feel today, as I did in 1913: I see no need for us to withhold our degree until the completion of the intern year. If there is no necessity for it, why go to all the unnecessary trouble that such a plan entails?

I have not the slightest objection to other medical schools requiring this fifth year if on account of local conditions or other reasons they think it best. I do not ask them to desist, but I do not want them to advocate that all schools should follow their example.

I, therefore, suggest we lay this matter on the table for another thirty-one years. Perhaps by that time I will have changed my opinion.

The Internship, a Requirement for the Degree of Doctor of Medicine*

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For a long time the internship has been considered an essential preparation of physicians for general practice and a prerequisite for training in medical specialties, so the internship must be considered as an essential step in medical education. The question under discussion at our meeting today is whether or not the medical school faculty should require an internship satisfactory to it before awarding the degree of Doctor of Medicine.

In the academic year 1913-1914, the medical faculty at Stanford University, after considerable study and discussion, took the following action: "All students will be required to take a fifth practical year in a hospital or laboratory approved by the faculty of the medical department." This action became effective for all students entering the medical school in the year 1914. Since our medical school requires "a fifth practical year" of all students before awarding them a degree of Doctor of Medicine, I should like to discuss our experiences with this requirement.

On the whole our experiences have been unusually good, and I present a review of the internships accepted by our students for the years 1932 to 1941 inclusive. This period should be a fair sampling of our twenty-six years' experience and will avoid the present disruption created by the war. Stanford University Hospital, owned and staffed by the medical school and its faculty, provides fifteen internships, and the Stanford service at the San Francisco City and County Hospital, also staffed entirely by our faculty, provides twenty-six internships. You will note from the chart that we have graduated five hundred twenty-five students in this ten year period. Five hundred ten students served hospital internships, and fifteen served a full year in five different preclinical departments in a school of medicine. Three hundred twenty-five students served their required fifth year at Stanford University, either in its own hospital services or in full time work in a preclinical department; fifty-nine served in hospitals owned and staffed by twenty-four other medical schools; seventy-nine served in seven hospitals approved both for internships and for residency training in the medical specialties but not used for the teaching of undergraduate medical students; fourteen served in Government hospitals, chiefly the United States Marine Hospitals, and the Gorgas Memorial Hospital at Panama, while forty-eight served in fifteen hospitals approved only for internships.

It would be of interest to compare this internship experience with that of students from a medical school not requiring a fifth year before graduation.

* Read at the Fifty-fifth Annual Meeting of the Association of American Medical Colleges, held in Detroit, October 23-25, 1944.

In approving and awarding internships we use the following procedure. We have a committee of three members of the faculty known as the Committee on Internships. Members of this committee are elected, one each year, to serve for three years. The Dean meets the members of the senior class shortly after registration in the first term of their senior year and discusses internship problems and suggests how they may proceed. Each student is required to submit to the Committee on Internships a list of three or more hospitals to which he wishes to apply, arranged in order of first, second and third choice. The committee then reviews the list to approve or disapprove any particular selection made by a student. The intern files his application for an internship with the hospital or hospitals and in each case the application is accompanied by a letter of recommendation from the Dean. The Committee on Internships itself acts as a selection board in cases of first choice for our own services.

The list of hospitals approved by our Committee on Internships is not very large, nor are the requirements for approval too rigid. The list is amended, usually, each year. The committee will approve any hospital staffed entirely by a medical school faculty and in which undergraduate teaching is done, and will approve any hospital which is approved both for internships and resident training in the specialties. Other hospitals are approved after personal investigation, by knowing members of the hospital staff and its organization, and from confidential sources considered satisfactory to the committee itself. I should like to say that the list of approved hospitals made available by the Committee on Internships of this association has been almost invaluable to us at Stanford during recent years. The committee permits the internship to be either rotating, mixed or straight in type, but requires it to be of one year's duration. This latter requirement, of course, was amended to a nine months' period for the duration of the present war.

Several times during the past twenty-six years the faculty has reviewed this question of the required fifth year before graduation. The last review by our Committee on Curriculum was made in June and July, 1944. Opinions of our own faculty concerning the requirement are not unanimous, but again the majority of the faculty, believing that an internship is an essential requirement in the training of a physician, did not see fit to recommend any change, at least at this time.

Certain objections, a few of them having some validity, can be raised to the internship as a requirement for graduation from medical school. For instance, "The medical school faculty has no control and frequently little or no contact with certain hospitals wherein students are permitted to intern, thus the faculty is deluding itself by including the internship in its curriculum." This might be true, sometimes is true, but of necessity does not have to be true. It depends entirely on the hospitals approved by the Committee on Internships. Hospitals which are known not to provide a satisfactory internship, of course, should not be approved by the faculty. "State Boards of medical licensure should require the internship before a candidate is eligible for the examination." At

the present time, I believe, an internship is a requirement for medical licensure in twenty-three states, the District of Columbia, and three territories, but is not a requirement for licensure in twenty-five states, of which California is one. I heartily approve, however, of the recommendation that boards of medical licensure should require an internship of at least twelve months' duration before a candidate is eligible to take the examination. "This requirement is of the greatest benefit to the inferior students who stand low in their class rank, and such students cannot be entirely remade during an internship." Our own experience has shown that this statement is not always valid. Several times students who have ranked low in the class so far as academic grades are concerned, have made outstanding interns, have earned and received appointment as assistant residents, and in several instances, residents, in excellent training hospitals, including our own. This has happened so many times that it has attracted our attention.

Some claim that internship supervision is a function belonging properly to hospitals and that the medical school faculty should wash its hands of the student as soon as he has completed the examinations in his senior year. Others have expressed the opinion that a clinical clerkship is a waste of time for a physician entering the fields of preclinical and laboratory medicine. I have heard several teachers of medicine state that they did not require an internship of their own students because they were able to appoint to their own hospital services better interns from other medical schools. That has not been our experience at Stanford, as you can see from the chart. With forty-one internships in our own services, we have appointed several interns from other schools each year. I would direct your attention to the year 1937 which shows forty-two of our class of sixty-three serving their required fifth year at Stanford. Four of those were in preclinical departments, all at Stanford University School of Medicine, and only three interns from other universities were appointed that year. Ordinarily, however, we appoint from four to eight interns who are not Stanford graduates.

Students themselves, from time to time, have voiced objections to this requirement. They feel handicapped by not being "doctors" while serving their internships with men from other schools who already have received their M.D. degree. A few students complain because they are permitted to take the State Board examination for medical licensure only after the completion of their internship which is a year later than they would prefer. This latter objection may be met by awarding the degree of Bachelor of Medicine on completion of the required four years of medical school work, or by Boards of Medical Examiners permitting students to take their examinations before completing the internship and therefore before actually receiving the M.D. degree. A license is not issued until the diploma is presented to the board.

One objection, not infrequently voiced, is that the administrative and labor problems in the Dean's office would be greatly simplified if the internship was not required by the medical school. With this I can heartily agree.

I favor the internship as a requirement for medical graduation for the following reasons. Medical school faculties have the responsibility of assuring their institutions and the public that their graduates are prepared to practice medicine. It is generally agreed that an internship is a requirement for medical practice. The required internship before graduation is certain to yield a better product than graduation without it. Experience at Stanford indicates that this requirement aids and at times protects the student in securing an internship of adequate educational content best suited to his ability and his own plan for a life long career. I have the suspicion that competition for interns by hospitals offering inferior training will be almost venomous as soon as the war is over. I am confident that students will be guided into better hospital training under a fifth year requirement than they will if they are turned loose at the end of their senior year to seek places by themselves. Internships and residencies are just as much a part of medical education as are required courses in physiology, medicine or pathology. The importance of graduate medical education is increasing steadily, and medical schools, not hospitals and licensing boards, should supervise and control graduate as well as undergraduate training in medicine.

In closing I make two suggestions. First, that this association recommend to its member colleges that a required fifth year, either as an internship or a year in a preclinical department, be a requirement for the degree of Doctor of Medicine, and second, that the Federation of Boards of Medical Licensure and all states not already provided with it be urged to require an internship of not less than one year's duration before any candidate is eligible for medical licensure.

INTERNSHIPS: STANFORD MEDICAL SCHOOL

Year	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	Totals
Number in class.....	48	40	46	45	53	63	57	56	59	58	525
Stanford University service.....	24	25	32	31	31	42	36	36	35	33	325
Other University Hospitals.....	5	7	2	4	7	6	5	6	5	12	59
Hospitals Appr. Res. Training.....	10	5	7	6	7	10	9	8	10	7	79
Government Hospitals.....	4	1	0	1	1	2	0	0	1	4	14
Approved for Intern Training.....	5	2	5	3	7	3	7	6	8	2	48

Requirement of Internship for Graduation*

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In February, 1911, Dean F. F. Wesbrook reported to this Association at its twenty-first annual meeting held in Chicago, that the University of Minnesota would henceforth require a fifth or intern year before granting the M.D. degree. He stated that this decision had been arrived at not only in the interest of better medical education but also to safeguard the welfare of the people of the State. Opinion favoring this proposal had been obtained from members of the Minnesota State Medical Society, State Board of Health, State Board of Medical Examiners, and from various hospitals and medical officers of state institutions. Consideration by the medical faculty of such a step had been in progress for about five years during which time several medical schools had recommended internship on an optional basis.

The reaction of the Association to Dr. Wesbrook's announcement was divided. There was the objection that in certain states the medical degree was prerequisite to the assignment of house officerships and the attitude of the Association seems to have been summed up by Dr. H. A. Christian in his discussion of Dr. Wesbrook's paper, when he gave as his opinion, (1) that the medical colleges of that day were not in a position to administer the four years satisfactorily; requirement of a fifth year might result in weakening the four year course, (2) many medical schools would have difficulty in placing their students in hospitals because the schools did not control sufficient hospital positions, (3) it would be to the disadvantage of better hospitals to have their interns assigned in this way, for young physicians might be encouraged to leave their services after fulfilling the requirement for their degrees, and (4) there would be difficulty in controlling students in the hospitals and in selecting hospitals. Dr. Christian concluded by saying, "I think it is an experiment which we shall all watch with great interest. . . . I think the rest of us had better wait and see the success of their plan before we urge the fifth year as a part of the curriculum."

More than thirty years have passed since this discussion, yet the majority of medical schools have not yet instituted the requirement of an intern year, or its equivalent, before granting the degree of Doctor of Medicine. The number of medical schools in the United States which adopted the fifth year requirement at one time reached fourteen, but these have since been reduced to five through the exigencies of war and for other causes. At the time the internship requirement was adopted by the University of Minnesota, a certain proportion of medical graduates entered practice directly from medical school. Today that situation is quite different because twenty-three states, as well as the District

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of Columbia, Alaska, Hawaii and Puerto Rico, require the completion of an internship before granting medical licensure.

The recently revived interest in the requirement of an internship for the M.D. degree would seem to make desirable a brief summary of Minnesota's long experience in this field. At an early date, a Committee on Internships was appointed to classify hospitals and select those in which the students should be permitted to intern. The rules for accrediting hospitals were rather cumbersome. Dr. J. C. Litzenberg, professor emeritus of obstetrics and gynecology and for many years Chairman of the Committee on Internships, reviewed this subject before the Association in 1934. Many of the procedures which at that time were thought to be necessary for the maintenance of proper internship standards now have become unnecessary, as for instance the investigation of hospitals through information received from older alumni in various localities. "Rules Governing the Selection of Hospitals for the Intern Year and the Conduct of Interns in Such Hospitals" were adopted by the Administrative Board of the Medical School in 1923. Present policy, however, permits students to intern in any hospital approved by the American Medical Association and by the American College of Surgeons. It is no longer the practice of the Medical School to request hospitals to fill out a questionnaire regarding their clinical teaching facilities. The investigation of such facilities is considered to have become the function of the accrediting bodies. In addition to the information which these agencies make available, a confidential appraisal of internships in their areas by the deans of medical schools is proving exceedingly valuable in advising students about hospital services. An important practice has been continued, that of filing of reports from all former interns about the instructional opportunities, experience and treatment accorded them in the hospitals where they have served. Although not all interns' opinions coincide, it is apparent that the quality of an internship may be judged quite reliably in these reports.

During the past three years, our students holding the M.B. degree, which is conferred on completion of the fourth year of the medical course, have interned in 105 hospitals located in twenty-nine states, the District of Columbia, Canal Zone, Hawaii and British Columbia. Concerning most of these hospitals we had a great deal of information but on a few of them we had no information other than that contained in the listing of Approved Internships by the Council on Medical Education and Hospitals. The Committee on Internships of our medical school at present controls 32 internships, a reduction from the 40 to 50 similar positions available 10 years ago. Thus, in a graduating class which averages about 110 students, 75 or more seniors must obtain internships in competition with graduates from other schools.

The efforts to assist and guide this group are as follows: Late in the junior year, the Chairman of the Internship Committee meets with the class to discuss and advise concerning the selection of internships. At this time each student receives a mimeographed statement prepared by the Committee on Internships. This statement explains the rules which govern internship acceptance, includ-

ing at the present time the regulations promulgated by the Procurement and Assignment Service and the Army and Navy for those liable for military service. Attention is invited to the various types of internship available with emphasis on the desirability of an internship longer than one year where feasible. Students are not encouraged to contract for a hospital service in a specialty without first having had a one year rotating or straight medical service. Advice is offered regarding the relative advantages of charity and private hospitals and of university connected hospitals, the facilities essential to any hospital worthwhile for internship, and the question of stipends. The student is informed that no credit can be given for an internship unless it is authorized in advance by the Committee on Internships.

During the remainder of the junior year, the medical student receives additional information on this subject from time to time. He must register his first, second and third choice of hospitals and assignments to those hospitals in which the medical school controls internships is made on a basis of scholarship and individual preference at the end of the junior year.

After the student has reported to the hospital to which he has been appointed, it is customary to request of that institution two sets of grades on his work, one at about the midpoint of his internship and the other on its completion. The rating of the intern is as regards observance of hospital rules, conscientiousness, attitude toward the staff and patients, and the general quality of his work in various departments. The final report, which is made on the day the intern completes his service, bears the endorsement of the hospital and recommendation that the intern receive his Doctor of Medicine degree.

One early apprehension of medical educators concerning the requirement of the intern year for the M.D. degree apparently has proved unwarranted. Dr. Pepper, in 1913, expressed his thought that a candidate might fail to receive his degree through the action of a hostile hospital administrator. To date such an injustice has never been done to one of our students. In a very few instances, hospital superintendents have been unwilling to recommend an intern for graduation. In such cases the internship committee has either concurred in the decision of the hospital superintendent or has worked out some compromise which was acceptable to the Administrative Committee of the Medical School.

A useful purpose is served by having on file the evaluation by hospital administrators and staffs of the professional abilities of our graduates. In later years requests for information about our medical alumni are received from hospitals, postgraduate centers, and others who can grant special privileges and opportunities. It has proved helpful to have on hand the evaluation of a physician's early reaction to clinical responsibility in complying with these requests.

In conclusion: The view may be entertained by some that to continue to require the intern year, or its equivalent, before granting the medical degree constitutes regimentation which serves no useful purpose. However, it is the belief at the University of Minnesota that this requirement has worked out

very well and that it has provided correlation between the Medical School and hospitals which might not have been attained in any other way. While this has been most evident in the administration of internships controlled by the Medical School, nevertheless, certain other hospitals have come to offer most satisfactory cooperation. The requirement insures the attention of our students to advice offered about different types of internships. It has resulted in a better final evaluation of the graduate; this may react to the advantage of the doctor later. The requirement has focused the attention of the student (and of the medical school) on the quality of intern training offered by various institutions. It seems to us that these are net gains in medical education which justify the continuation of the requirement.

DISCUSSION

DR. STANLEY DORST (University of Cincinnati): Perhaps, I can best discuss the problem which has been the topic of the three preceding papers by first reviewing briefly our experiences at the University of Cincinnati. In 1922, the Faculty Council approved inauguration of the fifth or intern year as a requirement for the degree of Doctor of Medicine. This action was not retroactive and, therefore, did not apply to classes already enrolled in the medical school. Hence, it took effect with the class which was graduated in June, 1926. The requirement remained in force until 1940, so we had fourteen years' experience with the internship as a requirement for the doctorate in medicine.

I was not a member of the faculty in 1922. In fact, I was then a junior medical student in the College and therefore I cannot speak from personal experience concerning the motives which led to the adoption of the program. In later years, I heard it discussed frequently, and I have talked with members of the Faculty of Medicine who were on the Faculty Council at the time the ruling was adopted. It seems that there were three purposes to be achieved by the then new regulation:

1. To make certain that every graduate of the College of Medicine completed at least a year of hospital training before entering upon the practice of medicine.
2. To attempt to improve the quality of internships offered our students through the procedure of establishing a list of approved hospitals, recognizing the fifth-year requirement only when the internship had been served at such an approved hospital.
3. To gain additional information regarding the quality of the internship and regarding the work of our students during the fifth year by requiring (a) a quarterly report from each man during his internship, and (b) a biannual report from the superintendent of the hospital concerning the work done by the intern.

How well did we accomplish these three purposes during our period of fourteen years' experience?

Purpose 1: It is difficult to see now why Faculty Council, even in 1922, was greatly concerned over the fact that our men might not spend a year in a hospital internship. A review of our records from 1921 to 1926, when the program went into force, shows that only four men failed to take internships and that none failed to serve an internship during the years 1924 and 1925. It would appear that the necessity for such action as it relates to purpose No. 1 had disappeared before the regulation actually went into force.

Purpose 2: To improve the quality of internships by establishing a list of approved hospitals. It is somewhat more difficult to evaluate the true effectiveness of the regulation as it relates to this aim. I believe it must be said in all fairness that many men served in better institutions in the early years of the experiment than had previously been the case. The superintendents of several of the hospitals to which our men had previously gone and which were not on the approved list came seeking advice concerning methods for improving their services in order that they might qualify. However, there is little to show that the desired improvement resulted from these conferences. Another and very much more powerful pressure came into existence about the same time. I refer, of course, to the increasing number of hospitals offering internships which led to increasing competition all over the nation. Hospitals learned that the intern could not be taken for granted. There were many more institutions seeking interns than there were interns to go around, and it soon became apparent that if hospitals were to keep their house staff intact, they must cease the business of exploiting the intern and see to it that his service was made attractive and worthwhile. Furthermore, we must not lose sight of the fact that, at about the same time, the Council on Medical Education of the American Medical Association began to "bear down" on hospitals offering unsatisfactory services. Institutions were more distressed by the fact that they were taken off the approved list of the Council on Medical Education than they were by being blackballed by an isolated school. I would conclude, therefore, that our experiences locally with the improvement of internships in some hospitals can be attributed only in very small part to the fifth year requirement at the University of Cincinnati.

Purpose 3: To gain additional information regarding the internship through reports from students and from the superintendents. As far as my own experience is concerned, and that of my immediate predecessor in office, Dr. Alfred Friedlander, I can say that we learned little that we did not already know and that the chore involved was not worth the minimal gain.

For more than a decade, we have had a committee of three men who, between them, know the hospital internships of the country amazingly well. These men have in the past and will in the future advise every student concerning his qualifications for certain types of internships, and they make every effort to place each man in an appropriate institution. This is important. It must not be lost, but I would point out that it bears no obligatory relationship whatever to the policy of requiring the fifth year for the doctor's degree.

I believe you will see, therefore, that my opinions are aligned more closely with Dean Pepper's than with those expressed by Dean Chandler and by Dr. Creevy. May I consider, briefly, the concluding statements made by Dean Chandler because, while I find myself for the most part in agreement with his statements, I do not agree with the assumption that they are dependent on the fifth year requirement.

Dean Chandler favors requirement of internship for graduation because he believes (I quote), "Medical school faculties have the responsibility of assuring their institution and the public that their graduates are prepared to practice medicine. It is generally agreed that an internship is a requirement for medical practice. The required internship before graduation is certain to yield a better product than graduation without it." I find myself in entire accord with the first two statements, but I believe that the third is a non sequitur. If it is necessary for schools to require the fifth year in order to make certain that their students will serve an approved internship, then he is right, but this is certainly not the case at the present time at the University of Cincinnati. All of our students are seeking the best internships they can get regardless of a fifth year requirement. The value of an internship before practice is now so well appreciated that coercion is no longer necessary.

Dean Chandler also states in his conclusions: "I am confident that students will

be guided into better hospital training under a fifth-year requirement than they will if they are turned loose at the end of the senior year to seek places by themselves." Again, I can find no fault with that statement, but I would point out that the implied assumption, that students not required to take a fifth year will be turned loose to seek places for themselves is again a non sequitur. It is certainly the responsibility of the faculty and the administration of each medical school to make certain that students are not turned loose to seek by themselves, regardless of the fifth year requirement, and I assure you that our efforts in that direction have not been abandoned since we repudiated the policy of withholding the M.D. degree until completion of internship. If anything, we have been more effective in guiding students. In 1944, in spite of the restricted number of internships now available in university hospitals, 62 per cent of our graduates were placed in university teaching centers. The last year before the Office of Procurement and Assignment placed a numerical restriction on internships, 78 per cent were placed in university hospitals. The remainder served in a group of critically selected institutions. These figures are undoubtedly somewhat more significant than Dean Chandler's because we accept less than one-third of each graduating class for service in our own University Hospital, while at Stanford University approximately 60 per cent of each graduating class has been placed in the University Hospitals there during the past decade. Our policy has been to divide the internships available in the Cincinnati General Hospital equally between graduates of our own school and those of other institutions because we believe that a cosmopolitan intern group, representing a cross section of students from many medical schools, is one of the best safeguards against local provincialism. We also believe that we provide a fine educational experience by sending as many of our men as possible to university services in other centers.

Dean Chandler's final conclusion, namely, that the importance of graduate medical education is increasing steadily and therefore medical schools, and not hospitals and licensing boards, should control graduate as well as undergraduate training in medicine impresses me as being theoretical rather than practical. With or without a fifth year requirement, I do not know how the University of Cincinnati will control and supervise internships served in hospitals throughout the United States. I believe that we should make every effort to require a high standard of internship, but the desire to achieve such standards and the recognition of their ultimate worth to the hospitals must surely be developed within the institutions themselves. I do not believe it can be imposed by the medical schools.

In conclusion, then, I can say that I no longer see any genuine necessity for continuing the fifth year requirement at the University of Cincinnati. This is not my personal opinion alone. When the matter was brought before the Faculty Council in 1940, the decision to discontinue the requirement was critically discussed and passed without a dissenting vote. We believe that all the good which has been attributed to such a requirement can be achieved without it; we believe that if properly organized and carried out, it involves a tremendous lot of fruitless work; and finally, we believe that from the academic point of view, it is a requirement without meaning.

Sir Richard Livingston, President of Corpus Christi College, Oxford University, has recently published a little book on education which I have the temerity to recommend even to members of medical faculties and their Deans. In an early chapter he condemns the curious fault of loading our educational programs with inert ideas—ideas which, when seen in operation, labor profoundly and encumber the smooth, simple, direct accomplishment of purpose.

May I submit that in 1944 the fifth year requirement for the M.D. degree is an inert idea in medical education?

DR. RUSSELL H. OPPENHEIMER (Emory University): There are so many different angles to this question that I wish to address myself to one only and since Dr. Pepper

referred to 31 years ago, it seems to me that gives us an opportunity to consider this question from one standpoint alone. I refer to looking backward over what has been accomplished.

In anticipating any type of movement or in attempting to direct the development of anything, it is just as important to look backward as it is to look forward because in looking backward, we see what we have accomplished, what have been the needs and the requirements we have found it necessary to meet, how we met them, and from that we can gain considerable information as to how to recognize and meet the problems which are ahead.

I am quite sure that if Dr. Pepper would for a moment think about the medical school with which he was connected 31 years ago, he would realize that that medical school, compared with the medical school of the present, was merely a primary grade school. The point I wish to bring out is that as far as the preparation of the young man for the practice of medicine is concerned, the medical schools have moved a long way.

We have advanced admission requirements from no high school to two years of high school, to high school graduation; from one year of college to two years of college to three years of college. We have increased the medical curriculum from one year of lectures to two years, in which the student heard the same lectures, and then we have gone on to a three and finally to a four year program. We have almost eliminated lectures from the curriculum and we have done what really is necessary in any educational experience, that is, we have tried to give our students the ability to develop erudition and increasing responsibility in that field in which they intend to exercise their arts and skills.

I feel that if we look at the medical situation at present, that is, medical education, we have done a perfectly remarkable job. So, the question we have to answer resolves itself into two points. One is, should the medical schools concern themselves with the hospital experiences the student is to have in the future? Without argument, I will say that I agree that they should.

The second question is, Have we come to the time when we should add an additional year as a requirement for the M.D. degree? If so, I am ready to move forward with it along with the rest, but when we do, I think we should do it as a sound academic educational announcement and responsibility, that we should analyze it from the academic background, that we should announce to our students that medicine is no longer a four year curriculum but a five year curriculum and that no longer can they get a medical degree in four years. With all due respects to schools which grant a B.S.M., or whatever this degree is, at the end of four years of medicine, then give them the M.D. subsequently, that first degree of Bachelor of Medicine is insignificant. It does not mean anything to the student nor does it mean anything to the public or anyone else. It is a token. It is one thing he can hang in his office among the hundreds of things he can hang there. But if we do need five years, we should produce that fifth year.

When this Association met in Cincinnati and the question about medical schools concerning themselves with internships came up, I said that I felt the medical schools should take the responsibility they face and meet it in the best way they can. I, therefore, favored our participation in improving the educational content of internships. If it is essential at this time to add a fifth year, then we should assess the difficulties and the needs. If they be the collecting of a group of hospitals about medical schools for that purpose, then do it, but I think we should be sure before we go to a requirement of an intern year that that is really what we want to do for an M.D. degree.

I do not want to say that I am thoroughly satisfied, and I am perfectly willing to take off my shoes, black or brown, and get into the mud or whatever it is and go after

this question of intern training, but I am not quite so sure that we are at the moment in a position where we really want to add a fifth year of preparation for the M.D. degree.

DR. VICTOR JOHNSON (University of Chicago): In connection with the establishment of any kind of approved list of internships which might conceivably come out of some of the suggestions that were made, there is one fact that must be borne clearly in mind. Let me approach it in this way.

On the list of approved hospitals for internships now maintained by the Council on Medical Education and Hospitals, for every one hundred graduates each year, there are 160 openings. It might appear from those figures that the thing to do is to remove from the approved list many hospitals which admittedly present inferior programs. But if we examine the figures further, we find that a large number of men fill these 160 internships who are in their second year of interning, therefore the ratio of internships available to men who are occupying them is only 110 to 100. In other words, there is a 10 per cent leeway of unoccupied places instead of a 60 per cent leeway.

I think it is highly commendable that the medical schools are considering taking deeper interest in the educational program of the internship and I think that they might do a good deal to stimulate educating the hospitals to improve their educational programs.

DR. J. ROSCOE MILLER (Northwestern University): My reason for entering the discussion is that I represent one of the five or six schools requiring an internship before granting the M.D. degree. Northwestern University has had that requirement for a number of years. Our experience has been essentially that of Stanford University. The way we conduct the program is a combination of the Stanford program and the Minnesota program, with the exception that our student body is larger and is more widely disseminated, after they have completed their medical training. We have more than one-half the states of the Union represented in the freshman class and many of these men, of course, wish to go back to continue their training near their homes, consequently, it is more difficult to check on the type of training offered at hospitals accepting our students.

About 50 per cent of the student body remains in Chicago for their internship.

As far as Dr. Oppenheimer's remarks are concerned, I have been laboring under the impression that medicine was not a four year course at all but that it took five years to complete the course at this time. Practically 100 per cent of all graduates take internships before going into practice and between 23 and 27 states require the internship before a man is privileged to practice.

During the past two years, the Medical Council, which is the governing body of our medical school, has reviewed the question of requiring an internship before the M.D. degree is granted. They voted unanimously to continue the practice. At the present time, there is no inclination to alter the requirement.

DR. B. I. BURNS (Louisiana State University): Louisiana State University Medical School required an internship for graduation until 1940 when it was discontinued on my recommendation. The reasons for its discontinuance were that it was required by the State Board of Examiners and that it called for accrediting a year's training over which the school exercised no supervision in most cases. The importance of the internship is recognized but the requirement of it should be vested in the licensing authority.

The figures seem to be somewhat confused as to the number of states which require an internship for graduation and do not agree with my recollection of what those figures were in 1940 when I studied the matter. At any rate, in 1940, although there were certain states which did not require an internship, practically every one of them set up other

requirements which made it almost impossible for an individual to practice medicine in any state in the Union without an internship or its equivalent.

I would like to go on record as agreeing with Dr. Pepper and particularly with Dr. Oppenheimer who calls for a thorough study of the situation, and I take it, an organization of some sort for a real administration of it for all schools.

DR. A. C. BACHMEYER (University of Chicago): I can not go back 31 years, but I recall a discussion before this Association in Boston in 1923, in which there was considerable argument as to whether medical schools should be responsible or would accept the responsibility for certifying to the qualifications of their graduates to practice medicine or whether that was the responsibility of the state. There were those who argued that the medical schools should accept that responsibility and there were those who argued the other way.

Later on advances were made by the states, I think, through the Federation of State Medical Boards, suggesting that the colleges should take over that responsibility even to the point of agreeing to accept their graduates for licensure. The State Boards then could serve more effectively as enforcement agencies pertaining to irregular practices.

The question, I think, very largely resolves itself into this: Is the internship a part of undergraduate medical education? If it is a part of undergraduate medical education, then it would appear that it is a responsibility of the colleges to take control of it or, at least, to control it in some way or other.

In 1922, when the University of Cincinnati adopted the five-year requirement it was in acknowledgment of the responsibility of the college. It was not to assure that all of our students would serve as interns—I differ with Dr. Dorst on that point because if you look back of 1921 at Cincinnati, you will find that 95, 98 or even a higher percentage were serving internships,—but it was an acknowledgment that the internship was a part of undergraduate medical education and it was for that reason the university adopted the fifth year requirement and conferred the M.B. degree at the completion of the four year course, hoping that over a period of years we could make that fifth year a year of real educational value, one that would warrant the university to grant a higher degree, which would be the M.D.

When I went to Chicago in 1935, at my first meeting with the faculty, Dr. Anton Carlson moved that the fifth year requirement there be abandoned. I asked why, and the answer was, "We have no control of it. The university has no right in accepting that sort of work as a fulfillment of any academic requirement." I asked for a delay of six months, and in the fall of that year, when the faculty met again, having inquired as to the way in which the fifth year was being administered, I seconded Dr. Carlson's motion.

Unless, in this fifth year, there is a real educational content and value, and unless we can really develop the fifth year as a part of undergraduate medical education, I do not think we should merely require it as another barrier to the degree, but if it is to be regarded as part of the undergraduate medical education, then we should take the responsibility and should assume the work that it certainly will entail in order to carry it on properly.

DR. L. R. CHANDLER: I am not too impressed by these figures that every student takes an internship. I have not reviewed our own group recently, but in 1938 I took five years' experience at the end of the internship which is required with us. In no class were there more than two fellows who did not continue on for at least one more year of hospital work on their own volition, so I am not impressed by that set of figures as an argument.

I would like to ask Dr. Weaver one question. Of how much value does the Committee at Minnesota consider the opinion of the intern at the end of his internship? We have been getting reports from the intern on the hospital by departments, administration, food, and all the rest of it, reports on the intern from the hospital administrator, and in addition, from the chief of the service who is not the hospital superintendent. Three years ago, we discontinued asking the interns for reports. As soon as the war is over and we get equilibrium established some place, we intend to ask the doctor's opinion of the educational value of his internship about two or three years after he has had it. I would like to ask Dr. Weaver to express an opinion on the value of that report.

DR. M. M. WEAVER (University of Minnesota): Dr. Chandler has made a very excellent point; medical school administrators need to be careful in accepting the appraisals of internships by individuals who are, to say the least, still quite immature doctors. I have observed that in past meetings of the Association, it has been mentioned that these men's opinions of hospitals may be influenced unduly by the quality of bed and board they have received. I believe, however, that most of us can agree that these ex-interns, confronted as they are with the necessity of taking state board examinations and the imminence of competition in practice with other doctors, have had their attention focused sharply on the quality of the training they have received. Their opinions have to be taken with considerable weight. Perhaps, they are to be taken with more weight than the prospectuses which are issued by some hospitals on the internships which they offer.

The problem of evaluating the quality of an internship presents many difficulties, as the Committee on Internships will testify. Who is in the best position to judge the true quality of an internship? Can any one individual evaluate the various services that constitute a rotating internship? In answer to Dr. Chandler's question, we feel it is possible to place considerable reliance on the reports of our interns in this connection. Dr. Chandler's idea of requesting such an opinion four years after the internship has been completed has a great deal to recommend it.

A Study and Analysis of Faculty and Student Opinions of Training in Preparation for the Study of Medicine*

By

THE ILLINOIS STATE ACADEMY OF SCIENCE COMMITTEE ON
PREMEDICAL EDUCATION**

In 1939, the Illinois State Physics Teachers' Association sponsored a symposium on the teaching of physics to students preparing to study medicine. The seed planted at that meeting matured into a committee appointed two years ago to study the entire problem. Since detailed specifications were lacking, the first task of the group was to decide what to do and, after that, to determine how to do it. The details of our deliberations, while possibly of interest, need not occupy time here.

The questionnaires finally adopted for students and faculty are, by hind sight, open to considerable criticism. To save argument, these shortcomings are acknowledged at once. Still, it appears that much information has been accumulated which may serve as a guide to further study, although it must be conceded that the conclusions drawn from analysis of the data can be only tentative. With an improved questionnaire, the study will be continued as successive classes reach the stage in medical training when contact with clinical subjects has been sufficient to enable students to arrive at some objective opinions.

Also, it may be pointed out that we have had in mind the possibility of bringing about, in some manner, a more intimate acquaintance between liberal arts professors and members of the medical faculties. At no time since the program of premedical training was instituted has there been any significant degree of cooperation between the two groups. Each must assume a fair share of responsibility for this situation. We hope that both will realize that fact, and through the study of the data we shall secure in future, understand each other better. Teachers of liberal arts subjects have too often regarded the student who is preparing for the study of medicine as a not-so-necessary evil who is interested only in hurdling the successive requirements and then forgetting them as soon as possible. That this is an erroneous appraisal, is clearly indicated in some of the data to be presented.

* Presented by Dr. C. I. Reed at the Fifty-fifth Annual Meeting of the Association of American Medical Colleges, held in Detroit, Michigan, October 23-25, 1944.

** Personnel of the Committee: L. I. Bockstahler, Ph.D., Professor of Physics, Northwestern University, Evanston, Illinois; A. C. Brookley, Supt. Thornton Township High School, Harvey, Illinois; Harvey De Bruine, Ph.D., Professor of Biology, Elmhurst College, Secretary; Edmund F. Foley, M.D., Associate Professor of Medicine, University of Illinois; George H. Gardner, M.D., Asst. Dean and Associate Professor of Gynecology, Northwestern University Medical School; B. Vincent Hall, Ph.D., Asst. Professor of Zoology, University of Illinois; T. T. Job, Ph.D., Professor of Anatomy, Loyola University School of Medicine; A. B. Luckhardt, M.D., Professor of Physiology, University of Chicago; J. Roscoe Miller, M.D., Dean Northwestern University Medical School; John T. Reynolds, M.D., Asst. Professor of Surgery, University of Illinois; C. I. Reed, Ph.D., Professor of Physiology, University of Illinois, 1853 W. Polk St., Chicago, Chairman.

The statistical analysis was done by Harvey De Bruine, Blanche Popelka, Bessie P. Reed, and Lenore Whittier.

On the other hand, medical teachers have too often ascribed the medical students' deficiencies to the kind of previous training they have received rather than to their personal limitations. It must be admitted also that medical teachers have not always built onto the previous training in the most advantageous manner. Another organization has formulated plans which will be discussed later for fostering meetings, either at state science academy meetings, or other favorable local concentrations, of teachers of premedical subjects and of medical teachers, where problems of mutual interest may be discussed and weighed. We would extend that idea to the fostering of regional conferences for the students who have enrolled in college courses preliminary to the study of medicine.

The returns from the questionnaires are shown in table 1. Returns in both groups are somewhat disappointing and seemed to depend on two factors,—(a) the attitude of the institution toward the study and, (b) the methods of distribution and collection of the forms. It is impossible to make a comparative

TABLE 1.

Faculty Forms			Student Forms				
	Submitted	Returns	Per Cent		Submitted	Returns	Per Cent
Illinois	418	318	77	Illinois	356	102	28.6
Loyola	50	37	74	Loyola	340	145	42.6
Northwestern	180	52	29	Northwestern	339	227	66.9
Univ. of Chicago	150	20	13	Univ. of Chicago	300	27	9.
Chicago Med. School	100	30	30	Chicago Med. School	200	85	42.5
Total	898	457	51	Total	1,526	586	39.

evaluation of these two factors at this time. There is a tentative plan to ask the schools to collaborate further by submitting a new, modified questionnaire to each class, either at the end of the junior year or about the middle of the senior year. This will furnish a means of evaluating progress as successive classes advance to a sufficient degree to have some opinions on the value of the training they have received.

While it would be desirable to have some expression from physicians in general practice who received their general training within the previous fifteen years, it is scarcely practicable for this Committee to undertake the project. This suggestion is recommended for consideration by this Association. No matter how logically grounded one's personal opinions may be about the efficacy of the premedical program as it existed in peace time, the only test is the evaluation of the effect it has on the performance of the physicians who have been subjected to it and are now in practice. Their opinions may be colored, or improperly weighed, but certainly no more so than those of most medical educators.

It was not possible to make a statistical comparison of the returns from different schools and it is questionable whether the results would justify the procedure, although it will probably be done at a later date.

In table 2 are shown the responses of the faculties to the first question, "What do you consider the most outstanding deficiency in the premedical training?"

A few replies came under two or more heads so that the total number of comments received was 464 although 23 did not comment at all. It is difficult to evaluate the heading "Cultural training," although it covers the largest single group of comments. The definition probably does not cover the same scope in the minds of all those who used the term. In general, it may be taken to mean the content of college training not relating to the requirements in the sciences for entrance into medical schools. Certainly the magnitude of this quantum, however much one may discount its interpretation, forces serious consideration of this phase of training, especially since it is in substantial agreement with the majority opinion of the students themselves.

TABLE 2.

	No. Replies		No. Replies
Cultural training	138	Mathematics	19
English	51	Spelling	14
Basic sciences	39	No defects	12
Chemistry	22	Social sciences	10
Physics	21	16 other miscellaneous heads.....	1-12
Poor mental training.....	21		

English comes in for the next largest quantum of comment, and likewise must receive serious consideration. Other headings are not sufficiently prominent to call for special comment. Out of the entire number of replies only 12 were satisfied with the curriculum of the prewar period.

In table 3 are shown the returns in response to the next question as indicated. It is now apparent that the question was improperly set up, with the result that the returns are not entirely satisfactory but still sufficiently informative to be of value.

TABLE 3.

Which of the following would you prefer as entrance requirements for medical school?

	1st Choice	2nd Choice
Standard four year bachelor's degree.....	105	47
Present three year premedical course.....	83	191
Two years of general college work—not a premedical program.....	30	37
Premedical sciences taught in medical school.....	25	24
Do you favor qualifying examination for entrance to medical school in lieu of grade points	31	54
Yes 22 No 27		

The last question was not intended to be on the same footing as the four alternatives but was so interpreted in 59 returns. However, the data are not conclusive. But there is a decided preponderance in favor of general training as opposed to the more specialized and restricted types of training advocated so vigorously by a highly vocal minority of physicians, teachers and students.

In response to the question, "Is there, in your opinion, any marked over-emphasis in any field of formal training?", the replies were, "Yes," 99; "No," 156. Some of the comments were, "Too much spoon feeding;" "Too much laboratory rote;" "Too much science;" "Too much useless material." Obviously many of these comments are emotional reactions and are not carefully considered. On the whole, one is not inclined to attach too much importance to these. Also it is suspected that some of the commentators were influenced more by factors in the medical course proper than by those preceding it.

The next question, "Do you feel that more of the 'liberal arts subjects' (English, history, economics and political science) should be included in the preliminary educational program?" the replies were simply in line with the data in table 2, "Yes" 254, "No" 65.

"How many hours of psychology would you suggest?" The replies were not so easily tabulated but still the evidence is strongly in favor of more attention to this field.

More	235	Maximum number time will allow	8
None	40	Minimum requirement only	4

"What courses in zoology, following the elementary course, would you suggest for preliminary general training?" The data are shown in table 4. While there is some scattering there seems to be little doubt in the minds of the faculties that more biology is desirable since only a small number asked for none.

TABLE 4.

Comparative anatomy	175	None	22
Embryology	55	Histology	15
General zoology	25	14 other suggestions each	1-9
Parasitology	25		

TABLE 5.

German	190	Russian	22
French	102	Latin	12
Spanish	27		

Table 5 gives the data from the replies to the question, "Is it your opinion that students should have a reading knowledge of a foreign language before entering medical school? If so, which would you suggest?" In addition, 96 failed to specify the language. Of these, the division was, "Yes" 18, "No" 78. There were 12 scattered suggestions of Chinese, Greek, Italian, Portuguese, Swedish and ENGLISH! The total count was 439, so that 6 did not comment at all. The number suggesting Russian, while small, is still surprising, especially since it is not significantly less than the number voting for Spanish. None suggested more than one language. The trend of extraneous comments suggests that few of the contributors had given as much care and attention to this question as to most of the others and that the statistics are correspondingly less valuable.

Turning now to the 586 student returns shown in table 1, the first question dealt with the general plan of premedical training. The data are shown in table 6.

TABLE 6.

	Preference	
	1st	2nd
(a) Abolish the premedical program and have all this work done in the medical school proper	24	31
(b) Have a four year bachelor's degree before entering medical school	340	123
(c) Have a general two year college course—not prescribed premedical—then enter medical school	53	50
(d) Three year premedical course	163	240

Of the four alternatives offered (b) and (d) are unquestionably preferred to (a) and (c) both of which have been advocated vigorously in some quarters. In general, there is good agreement with faculty opinions.

In table 7 are shown data from a number of individual questions. In the first of these the majority is in agreement with the faculty on the same point but by a much smaller margin. But in regard to the necessity of reading knowledge of a foreign language, the students are in sharp disagreement with the faculty. The other material in this table calls for no comment at this point.

TABLE 7.

In your medical training have you ever felt that more work in English, History, Economics, Political Science, should have been scheduled in your PM program?

Yes.....366 No.....229

Are you of the opinion that a reading knowledge of a foreign language is important to a medical student?

Yes.....230 No.....370

Do you think a semester of Physics, beyond the elementary course, covering the principles of the induction coil, the electrocardiograph, x-ray equipment, vacuum tube amplifiers and generators, oscillograph, principles of optical instruments with special reference to their use in medical research and practice, would have been useful to you?

Yes.....445 No.....152

Would you suggest that all the elementary courses in the sciences in the premedical program be revamped and given a distinctly medical cast rather than the general nature as at present?

Yes.....198 No.....378

Have you ever had specific instruction in methods of study? How to take notes? How to outline?

Yes.....171 No.....420

The most striking points in table 8 are the large numbers desiring more knowledge of organic chemistry, and the small number who feel that present provisions are sufficient. However, there seems to be a significant demand for more of each of the major divisions.

TABLE 8.

What courses in chemistry, beyond the introductory course, would you suggest?

Qualitative	382	Physical and colloid.....	195
Quantitative	346	Food	2
Organic	597	None	22
Physiology	245		

TABLE 9.

What courses in zoology, beyond the introductory course, would you suggest?

Comparative Anatomy	421	Anatomy	2
Embryology	343	Dissection	1
Histology	229	Endocrinology	1
Genetics	68	Entomology	1
Physiology	73	Microscopic technic	1
Bacteriology	43	None	30
Parasitology	117		

The expressions of opinion tabulated in table 9 agrees in general with faculty opinions, except parasitology is in some demand.

An effort was made to induce students to evaluate the comparative usefulness of courses actually taken before entering medical school on the basis of their applied usefulness in the medical course. Three grades are used as shown in table 10. There is some question whether every student interpreted the inquiry correctly. Some evidently attempted to evaluate courses they had not actually taken. Many made no attempt at an evaluation. Others marked two grades and qualified their testimony with notes setting up conditions under which each would apply. For that reason the totals recorded are likely to be misleading.

More important than the formal statistics are the additional comments made by students in connection with the data in tables 10 and 11. Some of these

occupy several pages and are of such a heterogeneous nature as to preclude tabulation. However, some of these may be summarized in some broad generalizations.

First, the evaluation of usefulness as presented in table 10 is based on experiences with the course as presented. From the table, one might obtain an unfavorable impression of the usefulness of certain subjects such as physics and

TABLE 10.
Student Opinion of Comparative Usefulness of PM Courses Actually Taken.

	Least Useful X	2X	Most Useful 3X		Least Useful X	2X	Most Useful 3X
Inorganic chemistry	31	216	297	Business methods	34	99	15
Organic chemistry	61	134	360	Bookkeeping	37	35	17
Qualitative chemistry	129	234	153	Political science	70	88	62
Quantitative chemistry	114	215	165	Physics	82	194	229
Biochemistry	27	58	153	Trigonometry	184	162	70
Physical chemistry	123	98	72	Algebra	125	189	130
Advanced Organic	65	31	46	Calculus	102	95	22
Zoology	98	189	254	German	185	143	66
Comp. Anatomy	82	180	280	French	115	64	21
Embryology	83	130	258	Spanish	39	17	10
Histology	51	97	134	Latin	52	95	54
Parasitology	96	62	90	Greek	22	16	33
Botany	130	41	24	Russian	25	2	20
Bacteriology	44	74	115	English	85	144	299
Introductory psychology	98	178	192	Rhetoric	39	101	176
Advanced psychology	61	77	100	Speech	26	78	181
Abnormal psychology	35	59	132	American History	80	124	69
Philosophy	69	119	131	English History	86	75	20
Economics	98	82	57	European History	107	112	46

TABLE 11.

	Add	Reduce		Add	Reduce
English	150	4	Physics	41	10
History	113	17	Business	37	0
Psychology	102	5	Histology	34	5
Philosophy	101	7	Mathematics	34	20
Sociology	100	7	Art and Music	30	30
Chemistry	98	45	Anatomy	30	18
Economics	92	12	Rhetoric	29	0
Speech	88	1	Parasitology	29	2
Liberal Arts	84	0	Bacteriology	27	4
Political Science	46	2	Physiology	23	2
Languages	45	58			

Latin. Yet more than 300 students made comments to the effect that in both these instances they were referring to the courses as taught, not as they could be taught. Similar comments were made about botany, physical chemistry, economics and sociology. There was suggestion of increasing the amount of Latin, for example, but it was urged strongly that the method of presentation be adapted.

A second point of importance was that more than 200 students gave some indication that they did not believe that the comparative evaluation of a course as indicated in table 10 should be the only criterion for the desirability of taking the course. Stated differently, these students distinguished between the practical usefulness of a course and its value for training purposes. Had we realized that such a differentiation would be so widely recognized, the question would have included a phrase to bring out a statistically applicable form of information.

Individual student opinions may be discounted sometimes with safety. But when comments from students in five medical schools who received their preliminary training in approximately fifty colleges and universities agree so pre-

dominantly on certain points the fact cannot be taken lightly. While it is not our desire to derogate the work of our colleagues in other fields, there can be little doubt that there must be improvement in methods of presentation of such subjects as physics, English, Latin, psychology, mathematics, physical chemistry, modern foreign languages and botany, if students who take these courses are to regard them as anything other than "hurdles."

The fact that so many students have definitely expressed realization of something other than the practical usefulness in the medical curriculum as a reason for studying a particular subject, should reassure to some extent, those who fear unbalanced training unless the preliminary subject matter is rigidly outlined and restricted. Actually, as matters stand now more than one-half of the premedical curriculum is rigidly specified by the medical faculties. Our committee questions the desirability of that arrangement. Our conviction is strengthened by the following tabulations of opinions of the students who contributed data.

	Adequate	Insufficient	Too Heavy
Science in the premedical curriculum.....	418	84	66
Nonscience	236	290	29

It is our opinion that if more opportunity were given for medical students to study this problem and to report on it, we would get farther toward a satisfactory adjustment. We have more confidence in the seriousness and earnestness of the modern medical student than has been in evidence in the past when such problems have been under consideration.

It must be admitted that this questionnaire has not, so far, uncovered anything particularly new or original. A perusal of the literature published in the past quarter century reveals that every one of the main conclusions was discussed years ago by such men as Cabot, Capen, Lyon, Woodrow Wilson and others. Every volume of the *Journal of the Association of American Medical Colleges*, beginning with the first paper in the first volume, has carried some publication from which one might have predicted some of the things brought out here.

Apparently, most of such comments have gone unheeded since not much has been done about these problems. Whether our efforts will be any more successful remains to be seen. However, there is now under way a promotional program by Alpha Epsilon Delta honorary premedical fraternity which gives promise of a greater catalysis than has been furnished by any other activity in recent years.

In conclusion, it may be said that the data presented have served to emphasize a little more forcibly the problems of which many educators have been aware ever since the premedical programs were adopted, but toward the correction of which the educational institutions have not done enough.

This entire study disregards entirely the curtailments incident to the accelerated war time program because it is taken for granted that this is a temporary state with which few are satisfied.

Depending on the point of view, one may find in this report cause for either extreme pessimism or for marked optimism. It is the present view of the committee that neither extreme is justified, but at the same time, we commend to those in authority the responsibility for correction of the weaknesses made apparent, and for further study of the problems involved.

DISCUSSION

DR. H. E. SETTERFIELD (Ohio State University): I represent the Alpha Epsilon Delta Honorary Premedical Fraternity. We have several irons in the fire, you might say, regarding information about premedical education. One involves programs sponsored by our organization before various national associations, such as the Association of Biology Teachers and Physics Teachers, and so on. Another is meetings with the state academies of science to discuss this problem with premedical teachers and students. Finally, a survey which we are trying to initiate in the near future about which I wish to comment today.

You all realize, of course, that the medical schools are entirely dependent on the premedical college teachers for the preparation of students for admission to medicine. But judging from the many unsolved problems and unanswered questions, it is apparent that most of these teachers are not familiar with the discussions and decisions of this Association or with its publications. Alpha Epsilon Delta wishes to use its facilities and contacts to disseminate information to and among the premedical teachers so that they may be able to do a better job of education.

With this in mind, we have prepared a number of topics representing the most urgent of the problems confronting us. They will be sent to the Deans of the medical schools within the next month. It is not expected that each dean will comment on all topics, but rather on the ones that seem most urgent to him and to his school. We hope that the comments will be, not only those of the dean personally, but may represent a consensus of opinion among his faculty.

Our office will collect and edit the replies. They will then be published in pamphlet form and circulated to premedical teachers all over the country. In this way you can express your opinions on a number of problems and those opinions will reach many teachers with a minimum of time and energy on your part.

DR. D. BAILEY CALVIN (University of Texas): I would like to inject a word of caution into this discussion. During the last year, as has been common to most of you, we have interviewed a number of men for the Army and Navy, and we have found, I think, almost without exception that 90 per cent or more of the students who have been interviewed feel that the physics courses they have been taking are not satisfactory or, at least, in many cases, not even applicable.

On the other hand, the data Dr. Reed has shown us seem to indicate that the students themselves realize they are needing a more comprehensive background of training. Whenever this problem has been approached in many of the schools in our section where we have been sent to be interviewed, the professors have said, "We will be glad to give you a course in physics for medical students." This is not the answer to our needs. We are going to have to give our students as much physics as they can get. When an arts and science faculty member tries to plan a course in organic chemistry, in quantitative chemistry or in physics for medical students we would rather not give the student credit for it on his transcript.

The point is, and let us please keep this in mind, that we want good courses in physics with just a little bit of emphasis on how those principles, all of the principles

that they should learn, can be applied to the study of medicine. We don't want less physics. I think, at least, I am expressing the general viewpoint in this matter. I hope so.

Dr. Ogden, a moment ago, mentioned a little experiment we tried at Texas. We had seven weeks, as a result of the change in the Selective Service Law, in which to play around with orientation. As Dr. Ogden knows, the organization was left to the several departments. We got the department chairmen together and they decided what would be given for this period of some four weeks. It did not work out so well, primarily because we missed one major point. These students, although they have been subjected to such courses as we have discussed this morning, still come to medical school with a burning desire to study medicine, and when they enter the school for the first time, they are at their highest emotional pitch so far as the study of medicine is concerned and we tried to carry over from premedical to medical with courses somewhat similar to those they had already taken at a time when the boy's interest was primarily medicine and nothing else. That was poor psychology.

I would like to emphasize another point. At the time the student enters the medical school is the time when you can really take him on the hip, as we say in Texas, if you care to. Let us try to organize the first week or two or three weeks of our medical curriculum in such a way that the enthusiasm will be met with equal enthusiasm on the part of all our professors and there will be no psychological letdown.

DR. GEORGE H. GARDNER (Northwestern University): I was a member of the committee which made this survey. Dr. Reed is the chairman and he is responsible for it. Consequently, to him must go all credit for what has been accomplished. All of us recognize the shortcomings of a report based on the analysis of questionnaires and no one is more conscious of this than Dr. Reed. Nevertheless, several interesting facts have come to light again.

There seems to be a consensus of opinion that a minimum of three years of college work, and preferably a bachelor's degree, is most advantageous before a student enters medical school. Also, that our present science requirements usurp too much of the pre-medical's required curriculum. They should be lightened. Both students and faculty recognize the great need for a better knowledge of English, also for a broader education, especially in cultural subjects.

Here is hoping that there can also be a reduction in the time devoted to the study of modern foreign languages. Few of our students have, need, or ever use a reading knowledge of French or German; too few of them also have had any training in Greek, which, with the Latin, is so valuable to the medical student. I wish that this report had elaborated on the need for courses in methods of study in the premedical curriculum, just as I wish that it had advocated more training in pedagogy, not only for the faculties of medical schools but also for the faculties of the liberal arts colleges.

No doubt the majority of premedical students are exposed to the courses which will prove valuable to them in future years, but often these courses are presented in a manner which fails to emphasize not only their great value to the student, but also their relationship to each other. One member of our committee, a professor of physics, is thoroughly impressed with what has been talked about before this morning, the need for an additional correlating course in physics, and he is preparing a text for use in such a course in which the practical application of fundamentals of physics are demonstrated in a physiology laboratory, the electrical industry where X-Ray machines are being manufactured, in refrigeration plants, in optical manufacturing concerns and so forth.

I doubt if any of us believes that the students whom we have accepted in the past have had a woefully deficient premedical education, but we must keep abreast of the times and we should attempt to anticipate the demands on future generations. There are innumerable opportunities to improve premedical training and I concur in Dr. Reed's plea for closer cooperation between the faculties of secondary schools, schools of liberal arts and the schools of medicine.

Furthermore, there is real merit in his suggestion that there be courses of orientation for premedical students presented by members of the medical faculty. Although Dr. Reed predicts that the work of his committee will be carried on and that other questionnaires will be submitted to medical students, it is not expected that they will produce data which are at great variance with this report. The immediate problem for this committee seems to be the encouragement of closer cooperation between the teachers of premedical students and the faculties of medical schools.

This should lead to curriculum changes resulting in the elimination of certain antiquated courses, an increase in the time of a few, a reduction in the importance of others, and the addition of some subjects which must be added. All of this should produce a more desirable end product; that is, educate the physician of tomorrow as he should be prepared for his profession.

DR. S. I. KORNHAUSER (University of Louisville): I want to say a word in defense of modern foreign languages. Our future professors in the medical schools are going to be recruited largely from these medical students and it will be deplorable if they can not go to the shelf in the library and take down a volume of the *Archiv fuer mikroskopische Anatomie*, for instance, and translate any of it and read it. However, there is one good provision left, namely, if a student is going to get a bachelor's degree from a recognized college he has to take, at least, two years of some modern foreign language. I hope that after this war, our schools will teach modern foreign languages better.

In regard to physics, I feel that if the principles of physics are taught rightly, any student can apply those principles to the medical problems that are brought up later. I always try to teach the optical principles of the microscope and it is appalling to me that many students do not know the difference between refraction and dispersion. It is not very necessary to spend much time on medical instruments in college if they get the principles and foundations well drilled into them.

Perhaps, one of the reasons our courses in physics have not been good is that many colleges of liberal arts have let down on the mathematics requirement and the students then can not get physics correctly. If the colleges would come back, not to spoon feeding the student, but to giving him the things they know are necessary, not merely pampering him, I think we would get farther. We have sugar coated our courses too much and we have set our sights too low in thinking of the potentialities of the students to learn.

I fully agree with the previous speaker that if we give a goodly amount of material, they can get it, but if we set our sights low and give a minimum amount of material which they are to get, that is all they are going to try to get.

LT. COL. HAROLD C. LUETH (American Medical Association): I am very pleased to hear Dr. Reed's presentation and it takes me back to the time when he and I were on the program in Springfield, Illinois, where the matter of teaching physics to premedical students first came up. There is an old Army saying that before we solve any problem, there is always the question of means vs. task, to be answered. You are faced with the problem of teaching physics. That is your particular task and the means at hand should be very carefully explored. You want to teach men entering medical college the principles of physics and you should offer some concrete solution as to how that can be done. I think the Army has given you a method. They have had to teach physics, optics and electronics to people who just came off the selective service line, people who were clerks, ice men or this or that, and they have done it very successfully.

As a suggestion to your committee, it would be well that you review some of the training films and models prepared by the Army. Possibly you can find among that material of assistance. The subject can be taught very effectively so that men will get their basic principles of physics. Certainly, we ought to use the visual method with these excellent training films and some of them are sound films. It should be followed

up in the last analysis with the applicatory method where the student himself has to perform certain things. I think that will form your best solution to the problem at hand.

DR. REED: We hear a lot of talk about wanting students to know the principles of physics. Somehow or other, we disregard the psychology of the student in receiving, accepting and making use of it. Dr. Buckthaller is a member of the committee, professor of physics at Northwestern University. He has done an excellent job. We do not have any trouble with the students who have taken physics under him because he has put over the idea, without sacrificing any of the fundamental principles of physics, of the value of that material in the medical course. They come in expecting to use it and knowing how they are going to use it. Not only that, but they are very much interested in fundamental pursuits of problems to a still greater degree.

We do not mean to imply that we want to have this a strictly trade school applied course in physics, but the fact remains that the psychology of the students is such in relation to physics. Why should there be the pronounced difference in figures obtained for such courses as organic chemistry and physics? Organic chemistry is just as much a fundamental course and is taught fundamentally and scientifically and yet students are much more interested in that because for some reason it has been presented in a sympathetic manner.

A textbook of college physics is not available that gives the students any suggestion that you can generate an electric current in a living tissue. They come into the medical schools very much surprised that any such thing can happen. The old textbooks of natural philosophy that we had many years ago all had an account of Galvani's experiment rather in detail. They knew then when they read that that you could get electrical currents in living tissue. They come in with the idea that the electrocardiograph, for instance, is generated extraneously and used somehow or other to register heart activity. They do not realize that current is generated in the heart itself. They do not realize the possibilities. There is something wrong somewhere in the presentation. I do not know where it is.

The Teaching of Physical Diagnosis*

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A course in physical diagnosis is included in the sophomore curriculum of every medical school and in a few institutions is continued into the junior year. Judged from the catalog descriptions, the courses in physical diagnosis in American medical schools differ greatly as to the number of hours devoted to the subject, the apportionment between didactic and clinical teaching, and the manner of presentation of the subject. The sophomore course in physical diagnosis is apparently regarded as a minor one in most medical schools as indicated by the small number of hours provided in the curriculum. Between 50 and 100 hours are allotted for the course in the majority of the medical colleges, less than 50 hours in a few schools. Some provision is made for the examination of normal and abnormal subjects during the sophomore year in most medical schools, but the time set aside for clinical training at the bedside seems, in many instances, too limited for adequate illustration of the material covered didactically. Nevertheless, contact with patients, even though limited, does provide the student with a stimulus that is lacking in the few schools where the teaching is exclusively didactic or where the section work is restricted to the examination of fellow students. It is unlikely that a satisfactory foundation in physical diagnosis can be acquired through a course that runs for less than 100 hours and provides little or no opportunity for the examination of patients.

When one pauses to consider the function which the sophomore course in physical diagnosis should serve in the medical school curriculum, there seems to be every reason for classing it as a major course and providing sufficient time and clinical facilities. The chief purpose is to build an adequate foundation for the clinical work of the third and fourth years. To achieve this goal, it is necessary that students be thoroughly trained, (1) in the technique of history taking and physical diagnosis; (2) in the science and art of observation and (3) in the clinical application of anatomy, physiology and pathology in the interpretation and integration of physical findings. The sophomore course in physical diagnosis is the keystone and the various basic science courses the building blocks of an arch that supports the superstructure of clinical subjects. Just as the stability of the superstructure depends on care in building the arch and fitting the keystone, so does the quality of work in the junior and senior clerkships depend on the training in the basic sciences and the clinical correlation effected through the course in physical diagnosis. It is my intention to discuss, in general, the underlying principles and objectives of sophomore teaching in physical diagnosis and then to comment on the specific application of these principles to the course at Wayne University.

* Read at the Fifty-fifth Annual Meeting of the Association of American Medical Colleges, held in Detroit October 22-25, 1944.

UNDERLYING PRINCIPLES AND OBJECTIVES OF THE SOPHOMORE COURSE
IN PHYSICAL DIAGNOSIS

1. *Training in the Technique of History Taking and Physical Examination.*

Since students are called on to take histories and make physical examinations in connection with their junior clerkships, it is essential that they receive adequate training in these procedures during the sophomore year. To learn the technique of physical examination, sufficient time and clinical facilities must be provided for the student to examine a number of individuals under the close supervision of a competent instructor. The technique of palpation of the abdomen, percussion of the chest and other procedures cannot be acquired from a textbook but can be learned only by repeated practice under the watchful eye of an instructor who is capable of detecting and correcting faults. After the student has become adept in the art of palpation, percussion and auscultation, it is necessary that he continue to practice until he can carry out these procedures automatically. This enables him to give undivided attention to the detection and interpretation of the findings. Mastery of the technique of physical examination implies more than the mere acquisition of manual dexterity in palpation and percussion, however. The student must continue to make physical examinations until he can go through the entire routine without reference to printed directions or other notes. The necessity of complete mastery of a systematic and comprehensive routine cannot be emphasized too strongly, since many errors are the result of omission of a necessary step in the examination. As a further stimulus to perfection in technique, it is well to include in the course periodical practical examinations that require the student to demonstrate the technique of any phase of the physical examination.

2. *Training of the Student in the Science and Art of Observation.** From infancy, the average individual makes use of the senses of sight, touch, smell and hearing to observe and judge his fellow men. His observations are usually directed by primitive emotions and are made in an effort to determine whether another person represents predominantly a source of pleasure or of pain. Physical diagnosis, on the other hand, constitutes an art of trained observation. It requires that the senses be directed toward the determination of facts that provide a basis for the evaluation of the health of the individual and of the anatomical and functional integrity of the various parts of the body.

Just as the master detective picks up clues that pass unnoticed by the novice with equally good vision, so does the experienced clinician observe many signs that are overlooked by the beginner. One of the chief functions of the sophomore course in physical diagnosis is to convert students from casual to trained observers. Extraordinary acuity of vision or hearing is certainly not a prerequisite for skill in physical diagnosis. Anyone with normal vision, hearing and intelligence can eventually become a skilled diagnostician if properly trained and sufficiently perseverant.

* Some of the ideas presented in this section were contributed by Lt. Col. Dan W. Myers, Assistant Professor of Medicine, Washington University.

The first step towards this ultimate goal is an inseparable part of the training in technique of physical examination and consists essentially in giving the student a clear understanding as to the information that must be obtained about each part of the body. This serves to systematize and direct his observation toward specific objectives, thereby minimizing the danger of overlooking significant physical signs. For example, a student will progress much more rapidly in the ophthalmoscopic diagnosis of vascular disease if he is taught to trace systematically each of the main vessels to the periphery of the fundus and to take especial note of the caliber and character of the arteriolar wall. In following retinal arterioles he will learn to observe whether they are uniform or irregular in caliber, and he will estimate the diameter, at first by direct comparison with that of the corresponding vein and later, as experience grows, by comparison with his mental image of normal retinal arterioles. In judging the character of the arteriolar wall, he will direct his attention towards certain specific criteria, namely, the width and character of the light reflex, the presence and extent of perivascular sheathing, the course of the arterioles, and the appearance of the arteriovenous crossings.

The necessity for directing observation towards specific criteria applies equally well to the parts of the examination carried out by the methods of palpation, percussion and auscultation as it does to the part carried out by the method of inspection. For example, the student should be trained in abdominal examination so that when confronted with an abdominal mass, he will systematically proceed to gather the following data by inspection, palpation and percussion: (1) position, size, shape and attachments (including location of superior, inferior, anterior, posterior, right and left borders, the direction of the long axis, and the relation to other identified structures); (2) tenderness; (3) consistency; (4) character of the surface and margins (i. e., whether smooth, nodular, sharp, round, etc.); (5) mobility on respiration and displaceability by the palpating fingers; (6) intrinsic movements.

Cognizance of the information that should be searched for in the course of a complete physical examination is, thus, the first step in the gradual transition from the novice to the trained observer. Although the nature of the information to be sought and the procedure for eliciting it can be described in a textbook or imparted to the class through didactic lectures, the student can assimilate and apply it only if he is provided with adequate opportunity to examine patients under competent supervision.

Provision of adequate time and facilities for the examination of patients is important not only in training students in the routine of physical examination, but also in acquainting them with the many normal variations in physical findings and with the common abnormalities. Verbal descriptions of many physical signs, gleaned either from textbook or lecture, are often unappreciated by the student until he has actually observed the signs in patients. This is particularly true of findings elicited by palpation, percussion and auscultation. Such terms as skodaic tympany, bronchial breathing, egophony, crepitant râles, diastolic apical thrill, tambour aortic second sound, and to-and-fro blowing aortic

murmur, for example, have little meaning to the student unless the verbal description is accompanied or followed by a clinical demonstration of the sign. As soon as the student has acquired the fundamentals of technique and of normal physical findings through examination of his fellow students, he should be assigned patients. In his clinical work, it is important that the student first examine the patient without even a hint as to the findings obtained by others and later re-examine the same patient after the correct findings have been pointed out by the instructor.

Training in the recognition of abnormalities by the method of inspection may be carried out fairly successfully through the use of lantern slides and moving pictures. A large collection of lantern slides illustrating all the signs recognizable by the method of inspection should be a part of the equipment of every department of medicine. Lantern slides and moving pictures of illustrative cases are of especial value when appropriate clinical material is not available to demonstrate the particular physical sign being covered didactically. The more richly the course is illustrated by actual clinical cases and by lantern slides and moving pictures, the more thorough the training of the student and the more permanent the knowledge he has acquired.

The final step that must be taken by the trained observer is to arrive at a definite decision. The ultimate purpose of the physical examination is to determine the normality or abnormality of each portion of the body. With respect to any structure the examiner may reach one of three conclusions: (1) that the findings fall within the limits of normal; (2) that an abnormality exists, or (3) that he does not know. The third alternative is preferable to an equivocal answer, since the confession that one does not know generally carries with it the incentive to acquire the necessary knowledge so as to forestall such an answer in the future. Equivocation, on the other hand, is a listless expression of a stagnant mind. Neither the student nor the instructor should ever permit himself to make such statements as "the spleen is questionably palpable." If he is not certain on the first attempt, he should re-examine the patient with the best technique of which he is capable. If he is still unable to palpate a sharp edge on deep inspiration, he should indicate in the record that the spleen is not palpable. If someone else with better technique then demonstrates the palpability of the spleen, the original examiner will learn more and he will be less likely to make the same mistake in the future than if he had refrained from any conclusion whatever. It is essential that the student commit himself in writing regarding each portion of the body examined. He may find it easier to reach a decision if he constantly poses questions covering each point to be investigated. For example, in determining whether breath sounds are normal or abnormal, the examiner should seek information relevant to the following criteria: (1) type of breath sounds (i. e., whether vesicular, bronchial, etc.); (2) intensity of the inspiratory sound and (3) presence of adventitious sounds. The examiner may find it easier to gather the required information and reach a decision if he attempts to answer the following questions in every area auscultated: (1) What is the quality of the breath sounds and the relative intensity, pitch and

duration of the inspiratory and expiratory phases? (2) Is there any difference in the intensity of the inspiratory sounds in the corresponding areas on the two sides of the chest? If so, which is abnormal? (3) Are adventitious sounds present and, if so, do they consist of dry râles, moist râles, friction rub, etc.?

3. *Training in the Clinical Application of Anatomy, Physiology and Pathology in the Interpretation and Integration of Physical Findings.*—When confronted with the question of whether or not a given part of the body is normal or abnormal, the sophomore student, having no clinical background, must draw upon his knowledge of anatomy, physiology and pathology in arriving at an answer. Everything possible should be done to encourage and assist students in correlating physical diagnosis with the basic sciences. For example, diagrams of the physics of production and transmission of breath and voice sounds in the normal and in various pathological conditions aid greatly in the understanding of normal and abnormal physical signs in the chest. Diagrams of the mechanism of the heart beat, together with electrocardiograms, contribute greatly to the comprehension and bedside recognition of the arrhythmias. Serial diagrams depicting the position of the heart valves during the various phases of the cardiac cycle facilitate the interpretation of heart sounds and murmurs. The use of pathological specimens helps in the correlation of physical signs with the gross lesion.

It is essential that the student understand the mechanism of production of each physical sign. Whenever possible, the instructor should illustrate by diagram the mechanism of production of each physical sign or its anatomical, physiological, or pathological background or relationships, and the student should be encouraged to follow suit, for this is the best method of fixing the information indelibly in his memory. Knowledge that comes through visualization and understanding is generally retained well and applied readily at the bedside, whereas knowledge that is acquired by rote generally vanishes as rapidly as it is gained.

THE TEACHING OF PHYSICAL DIAGNOSIS AT WAYNE UNIVERSITY COLLEGE OF MEDICINE

History Taking.—The didactic instruction in history taking and symptom interpretation is given as a separate course two hours weekly for a total of eleven weeks in the first quarter of the sophomore year. The purpose of the course is to present the anatomical and physiological basis of each of the common symptoms and thereby provide the students with the background necessary for history taking and symptom interpretation. If the student has a clear concept of the various mechanisms for the production of a given symptom, he should be able to make appropriate inquiries and properly analyze the information obtained so as to arrive at a conclusion as to the significance and cause of the symptom. For example, if the student understands the various modes of production of paroxysmal dyspnea, namely, (1) bronchospasm; (2) sudden pulmonary engorgement due to left ventricular failure; (3) impingement of a mediastinal mass on the trachea due to shift in posture, and (4) the hyperpneic phase of Cheyne-Stokes breathing, he should be able to elicit the necessary information and arrive at an opinion as to the mechanism of the dyspnea in a given case. The clinical application is

provided by the junior and senior clerkships, during which the students are assigned patients on whom they take detailed histories and perform complete physical examinations.

Sophomore Physical Diagnosis.—The underlying principles and objectives have been discussed in some detail. The manner of application of these principles and the hours of teaching remain for consideration. The schedule provides two full afternoons weekly during the first two quarters and one full afternoon and one additional hour weekly during the third quarter, making a grand total of 231 hours for the teaching of physical diagnosis. Approximately 75 hours are devoted to didactic instruction, the remainder to clinical work.

The didactic instruction is given during the first hour of each afternoon period. The student is furnished with mimeographed notes covering the major portion of the course. These notes are organized in outline form and include a description of (1) the technique and objectives of each step of the examination; (2) the criteria that must be ascertained regarding each part of the body in order to determine whether it is normal or abnormal; (3) a description of the normal findings together with the relevant physics, anatomy, and physiology; (4) a classification and description of the various abnormal findings correlated with the pathological anatomy and physiology. This mimeographed outline enables the lecturer to devote his entire time to illustrations of the material and relieves the student of the necessity of taking notes, thereby permitting him to direct his undivided attention to the illustrations. An attempt is made to illustrate by appropriate lantern slides or by blackboard diagram the clinical characteristics, the mode of production, and the underlying anatomy, physiology, or pathology of every physical sign. The lantern slide collection has been built up gradually to the point where several illustrations are available for each of the common signs demonstrable by the method of inspection. Since signs that involve motion cannot be demonstrated adequately by lantern slides, work has been in progress during the past few years on the production of a Kodachrome moving picture.* In its present form the movie consists of fifteen reels, each approximately 400 feet in length. A large number of cases are presented that illustrate collectively most of the physical signs demonstrable by the method of inspection and are arranged in the customary sequence of physical examination. Thus each reel can be shown at an appropriate time in the course.

In the sophomore course in physical diagnosis an attempt has been made to cover not only the medical aspects of general physical examination but also the surgical, orthopedic, neurological, ophthalmological and otological aspects. Inclusion and correlation of these various aspects is essential in training students to make complete physical examinations and is also helpful in preparing them for the clinical work in the specialties during the junior year.

In the presentation of the course, it is advantageous to cover as early as possible the portions of the examination on which the students will need the

* A duplicate of the moving picture "Physical Diagnosis" by Drs. Gordon B. Myers, Fred Margolis and Muir Clapper is available on loan to accredited medical schools without charge other than transportation expenses.

greatest amount of clinical practice, namely, the examination of the optic fundus, the lungs and the heart. It is our custom to devote the first two periods of the first quarter to the procedure in the diagnosis of swellings or masses in the extremities or body wall, for the following reasons: (1) It provides an excellent example of the application of anatomy to the identification of the structure or tissue plane from which the mass has arisen; (2) it gives the student a concrete idea as to the physical characteristics that should be determined in order to identify any mass and thus acquaints him with a method of approach that will be subsequently applied to abdominal and pelvic examination; (3) it introduces the student to the main etiological types of lesion, namely, inflammatory, neoplastic, congenital, traumatic, degenerative and circulatory, and acquaints him with the general characteristics of acute inflammation, chronic granuloma, benign and malignant neoplasms, etc. In respect to edema, it affords a direct correlation between pathological physiology and clinical features. After introducing the course in the foregoing manner, we then take up the ophthalmoscopic examination for the following reasons: (1) The mere inspection of the fundus through the dilated pupil can be learned in a short time so that the student may soon be assigned patients; (2) on the other hand, a critical evaluation of the fundus requires trained observation, supplemented by long experience; (3) ophthalmoscopic examination exemplifies the necessity of directing observation towards certain specific criteria* and thus drills the student in the method of approach that should be adopted for every step in the physical examination; (4) it also provides an example of the clinical application of anatomy in the interpretation of the location and character of retinal opacities, the significance of vascular changes, etc. After covering ophthalmoscopic examination, we proceed to the examination of the thorax and lungs. The students are taught to interpret physical signs in the thorax in terms of physical change in the bronchi, lungs and pleura (such as consolidation, cavitation, fibrosis, atelectasis, etc.) rather than to interpret them in terms of disease entities (such as pneumonia, tuberculosis, bronchiogenic carcinoma, etc.) in order to emphasize the fact that physical examination leads to an anatomical diagnosis, whereas history and laboratory examination are usually necessary for an etiological diagnosis. The didactic work on the lungs is completed and that on the heart started before the end of the first quarter. The heart is completed and the abdomen, back and perineum are considered during the second quarter. The third quarter is devoted to general appearance, head, neck and extremities, which are covered in the usual sequence.

The clinical instruction is given during the last three hours of each afternoon period. The class is divided into sections and an instructor provided for each group of six students. Since the full time staff is not large enough to handle all of the students, residents in internal medicine are placed in charge of some of the sections. A senior member of the staff, however, supervises the entire group each afternoon.

* For example, to evaluate the optic disks the examiner should make specific note of the color of the disks, the character of the margins, the size and depth of the cup, the course of the vessels over the disk, and the V/A ratio at the margin. The specific criteria that should be ascertained regarding the retinal vessels have already been discussed.

During the first portion of the three hour period, the students examine one another under the supervision of an instructor. The purpose of this exercise is to train the students in the technique of physical examination, to drill them in the objectives of each step in the examination, and to familiarize them with the wide range of normal variations. When a new phase of the examination is first considered, the major portion of the afternoon is devoted to practice on normal fellow students and the remainder to a demonstration of abnormal physical signs. As soon as the student has become familiar with the technique and the usual normal findings, the greater part of the three hour period or the entire time is devoted to the examination of patients. Adequate clinical material is obtained through the medical service at Receiving Hospital, which has an average census of 180 cases, and the medical service at Eloise Hospital, which has an average of 420 cases in the hospital and 2,500 cases in the infirmary. In addition, the students spend a few afternoons at Children's Hospital, where instruction in the technique of examination of infants and children is given by the department of pediatrics.

One or two students are assigned to each patient. They are given sufficient time to carry out the parts of the physical examination in which they have received didactic and clinical instruction. Thus, during the first three or four weeks of the first quarter the examination is limited to the fundus and to a search for masses in the extremities or body wall. Throughout the remainder of the first quarter, the major emphasis is on the chest, but each student continues to make ophthalmoscopic examinations as well. During the greater part of the second quarter, the major emphasis is on the heart, but the students continue to make routine chest and occasional ophthalmoscopic examinations. Then the emphasis shifts to the abdomen, but cases with abnormal fundoscopic, pulmonary and cardiac findings are assigned to some members of the section. During the closing weeks of the third quarter, the students make complete physical examinations.

The students are expected to investigate each criterion and to set down a brief opinion in writing. Then the instructor brings together the six members of his group and goes over the assigned cases. While correcting the written report of the students who have worked up a case, he directs the remaining members of the group to check some specified feature. For example, if the patient has a consolidation of the left upper lobe, the students who have not seen him might be asked to compare percussion note, breath sounds, or voice sounds in the two infraclavicular regions. After quizzing the students on their findings, the instructor gives his own interpretation and then permits them to recheck the patient so as to fix the diagnostic features firmly in mind.

The final grade in the course takes into consideration the quality of the practical as well as the didactic work. The grade in the practical work is based partly on proficiency in technique and mastery of the routine of physical examination and partly on the ability to apply didactic knowledge of anatomy, physiology, pathology and physical diagnosis to the interpretation of the findings. This grade is derived from the daily section work and from a final practical examination

given at the end of each quarter. Fifteen minute written quizzes over the material covered didactically are given every one to two weeks, and a final written examination is given at the end of each quarter. The majority of the questions are in the form of case descriptions requiring a diagnosis as an answer. Such a question provides a test both of factual knowledge and of the ability to correlate and integrate facts in order to arrive at a logical conclusion. As a part of the final written examination it is our practice to project a number of lantern slides depicting cases with physical signs that should be recognized by the method of inspection. The knowledge that he will be called upon to identify physical signs from lantern slide illustrations provides the student with a stimulus to develop and utilize visual memory.

Junior and Senior Clerkships in Medicine.—The teaching of physical diagnosis is by no means ended on completion of the sophomore year. Although no formal course in physical diagnosis is given at Wayne University during the third or fourth years, the student is expected to review constantly the material covered in the sophomore year. As a further stimulus to such a review, each student is given a formal oral quiz on physical diagnosis when he is midway through the junior clerkship in medicine.

A detailed discussion of the junior and senior clerkships in medicine is beyond the scope of this paper. Before closing, I wish to stress that the ultimate attainment of skill in physical diagnosis depends not only on the type of foundation provided by the sophomore course but also on the clinical application in the junior, senior and later years. For proper emphasis on physical diagnosis during the clerkship, it is essential that both the student and the instructor attempt to make the diagnosis on the basis of history and physical examination alone without access to roentgenologic or laboratory data. The knowledge that their physical findings will be checked subsequently by appropriate laboratory studies provides both student and instructor with an added incentive to make a meticulous physical examination and thus furnishes excellent training for the instructor as well as for the student. Strict adherence to such a procedure is the best assurance of a steady improvement in diagnostic skill.

The Teaching of Parasitology and Tropical Medicine*

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Two years ago a committee made a report at the fifty-third annual meeting of the Association of American Medical Colleges on the teaching of tropical medicine in undergraduate medical schools of the United States.¹ This report showed that only 6 of 76 medical schools gave a required course which satisfactorily covered the parasitic and tropical diseases of man. Among other things, the committee recommended, first, that the Association urge medical schools to adopt a program for the adequate teaching of parasitic and tropical diseases; second, sponsor a program which would enable instructors from medical schools to attend intensive courses in tropical medicine; and third, that a distributing center for laboratory material be established.

One year ago the committee again reported to the Association at its fifty-fourth annual meeting.² This report showed that the approved recommendations, as well as additional suggestions, had been promptly and efficiently carried out by the committee aided by financial support from the Markle Foundation and with the cooperation of numerous individuals and agencies. Eighty-four instructors from 60 medical schools had attended courses given in tropical medicine, at either the Army Medical School in Washington, D. C., or Tulane University in New Orleans, Louisiana, during the period from January 1943 to August 1943. In addition to this instruction, a program had been put in operation which gave each medical school the opportunity of sending two instructors to the American Tropics for practical experience in tropical medicine. A center for distributing laboratory material had been established, and over 52,000 specimens were dispensed during the year 1943.³

The College of Medicine of Wayne University has been one of the medical schools that has taken advantage of this program sponsored by the Association of American Medical Colleges. As a member of the faculty who has participated in the plan to reorganize and teach the work in parasitology, I have been given this opportunity to tell, not how the course should be taught, but rather to report and demonstrate the improvements which we have been able to accomplish. We will depend largely on an exhibit of the material used in teaching to demonstrate these improvements.

In the past years, our school of medicine has had for its primary purpose the training of physicians for the general practice of medicine and surgery in our own community. Before the outbreak of the present war, records showed that the great majority of the medical graduates of Wayne University practiced in the state of Michigan. Consequently, there seemed to be no justification in

* Read at the Fifty-fifth Annual Meeting of the Association of American Medical Colleges, held in Detroit, October 23-25, 1944.

giving great weight in the curriculum to tropical or international medicine. With the onset of the war, we were faced with the immediate necessity of training military personnel who required instruction in parasitology and tropical medicine. At that time we lacked experienced instructors and, with the exception of a few class sets of malaria slides, and a few specimens of the more common helminthic infections, had no material for use in teaching a laboratory course in parasitology.

Early in 1943, two members of the faculty were assigned to attend the courses in tropical medicine being given for instructors from medical schools. One member of the Department of Medicine attended the course at the Army Medical School, and one member of the Department of Bacteriology and Clinical Pathology attended the course given at Tulane University of Louisiana. Upon their return to Wayne University, plans were made to introduce a required course of tropical medicine and parasitology in the sophomore year. Arrangements were also made in the schedule of two consecutive classes of seniors, so that the students having the most immediate need for the new course, would receive instruction before their graduation. In order to accomplish this, it was necessary to give the course four times during the period from August 1943 to September 1944, inclusive. As this work was in addition to the usual teaching duties, there has not been sufficient time to effect all the improvements desired.

In the suggested outline for a course of study of parasitic diseases, the committee suggested a minimum of 38 hours and a maximum of 90 hours. Later, Dr. Henry E. Meleney, chairman of the committee, outlined in detail a suggested course of 60 hours which, in general, we have been able to follow. A total of 81 hours is now allotted in our curriculum for tropical medicine and parasitology. Approximately 20 hours of this time are taken for the lectures in tropical medicine, and the remaining hours for the course in parasitology.

The lectures in tropical medicine cover not only those diseases caused by animal parasites, but also the tropical infections due to bacteria, viruses, rickettsias, spirochetes, as well as some of the non-parasitic diseases peculiar to the warm regions of the world. Because our basic textbook of clinical parasitology includes only those diseases caused by the animal parasites, mimeographed summaries of each disease studied were drawn up in outline form and given to the students. Each of these presents in concise fashion the essentials of the etiology, epidemiology, pathology, symptomatology, laboratory diagnosis, treatment, and prognosis of the disease under consideration.

We were confronted with the problem of how best to teach the clinical manifestations of these diseases, for we see but few of some of them and none of the others. The few cases observed rarely occur at the appropriate teaching period, therefore actual presentations have seldom been possible. Due to our conviction that patient presentation is one of the most efficacious methods of teaching clinical medicine, we have approximated it, insofar as is possible, by presenting detailed case summaries of our own, and other cases, supplemented by X-rays, pathological specimens, and colored slides to illustrate important

physical findings. Because there is a large amount of relatively unfamiliar material for the students to remember, we have placed considerable emphasis on the pathological physiology, linking up as much as possible the symptoms and signs exhibited to the underlying pathology. Life cycles of the parasites have been stressed from the clinical standpoint only insofar as they aid the student in grasping the epidemiology, pathologic physiology, and treatment of these diseases.

In the organization of the laboratory work it was necessary to provide time for the study of the animal parasites alone, since work on other parasites continues to be taught in the regular courses of bacteriology and clinical pathology. For example, the bacterial diseases such as the dysenteries, leprosy, cholera, etc., as well as the diseases caused by the rickettsia, the viruses, the spirochetes, and the fungi are being studied from the etiological standpoint in the bacteriological laboratory. In view of the importance of many of these diseases at the present time, more emphasis is now placed upon them, especially those caused by the fungi, the viruses, and the rickettsia. The course in parasitology has been further limited to the study of those animal parasites pathogenic to man, and to a consideration of their arthropod vectors.

In presenting the laboratory course, each parasite is first discussed in lecture form from the standpoint of classification, geographical distribution, incidence, morphology, life cycle, epidemiology, laboratory diagnosis, and prevention. Lantern slides prepared from textbooks, and Kodachrome slides of the parasites are used as visual aids. Following the lectures, the students proceed with the laboratory work.

It is possible for the instructor to prepare notes for lectures without great difficulty, regardless of his location, but the collecting of sufficient specimens of the animal parasites of man to be used in teaching a laboratory course is difficult and time consuming, even in the areas where these parasites are numerous. The specimens used by most schools teaching medical parasitology have been acquired over a period of years. Our immediate need for such specimens, and the scarcity or absence of these parasites in our own locality, seemed to present an insurmountable problem.

Fortunately, the committee solved this problem by arranging for the establishment of the Distributing Center, which has provided us with the majority of our laboratory material. We are deeply indebted for this service which has obviated many of the difficulties one encounters in acquiring a collection of such specimens. To a limited extent, we have augmented our collection with material from other sources. A number of slides, cultures, and stool specimens were obtained from Tulane University, with the cooperation of the staff under Dr. E. C. Faust. Dr. Malcolm H. Soule, of the University of Michigan, generously provided us with animals inoculated with trypanosomes, which we have used in teaching and in the preparation of stained smears. A number of slides for demonstration purposes, and 2 x 2 Kodachromes have been purchased from commercial sources. A few local cases of some of the parasitic diseases have provided addi-

tional specimens. Although our present collection is relatively small, when compared with those to be seen in schools of tropical medicine, we hope to enlarge our collection as new material becomes available, and as rapidly as limited technical assistance permits.

Three methods are employed in presenting the laboratory material to the students for study. Demonstration specimens are exhibited, fresh or preserved specimens are given out for individual study, and a set of prepared slides is loaned to each student.

The material used for demonstration purposes consists of both gross and microscopic specimens. The microscopic preparations are selected for their excellence in demonstrating the typical morphological characteristics of the parasites or their ova. A card with a drawing of the specimen as seen in the microscopic field, and with explanatory and descriptive notes, is placed at each microscope. With drawings prepared of a selected parasite or ovum on a slide, it is necessary to locate the same microscopic field for repeated demonstrations. In order to do this quickly, we have marked each slide by inscribing a circle around the specimen with the aid of a Winkel-Zeiss Micro Object Marker, which is a diamond-pointed instrument that replaces the objective of the microscope. The specific area of the slide containing the encircled specimen is further marked with permanent laboratory ink. While the preparation of such demonstration specimens is time consuming, it is much easier to find and demonstrate one specimen to the entire class than to assist each student individually in locating typical specimens. Once the student has observed the specimen under the demonstration microscope, he is better able to make a more fruitful search of the material furnished him for individual study. In some cases it has not been possible to obtain an amount of material sufficient for individual student use, and in these instances, the demonstration specimens alone must serve for the entire class.

Whenever possible, specimens are given to each student for individual study. This material consists of living cultures, fresh or preserved specimens, and material from inoculated animals. Cultures of intestinal amoebae and flagellates, trypanosomes and *Leishmania*, are carried in the laboratory for class use. Preserved fecal specimens showing cysts of the intestinal amoeba, flagellates and ciliates, and ova and larvae of the various helminthic parasites are furnished each student. Animals inoculated with trypanosomes and trichina furnish additional material for study.

In addition to the expendable material, each student is loaned a box of slides containing permanent preparations of intestinal parasites in fecal smears, blood smears of malaria, trypanosomes and microfilariae, and sections of pathological tissues. These are the usual specimens that comprise such a collection, but in addition to them, we have added permanent preparations of material containing ova and larvae of the various helminthic parasites.⁴ These slides have proved a helpful addition in that this material is permanently available for teaching purposes, and each student is able to repeat the examination of these preparations whenever, and as often as he may desire.

This course, as presented to the students, is the result of the composite labors of several members of our medical faculty. The lectures in tropical medicine are given by Dr. Muir Clapper, of the Department of Medicine, who has furnished the students with the mimeographic summaries of each of the diseases discussed. As a member of the Department of Bacteriology and Clinical Pathology, the duty of organizing and teaching the parasitology course was assigned to me. This work was at first carried on with the aid of a teaching fellow, Miss Bernice Bronstein, and, since the fall of 1943, with the added assistance of Dr. C. W. Buggs, who is largely responsible for the preparation of the illustrations used with our teaching specimens. Dr. H. L. Clark, Professor of Bacteriology and Clinical Diagnosis, has also aided in carrying out this program.

The steps outlined above have been taken, in accordance with the program sponsored by the Association of American Medical Colleges, to present an organized course of tropical medicine and parasitology to our medical students. Other medical schools have benefited from this same program, and we feel certain that they also can report progress, equal to, or greater than ours in meeting this educational emergency.

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DISCUSSION

DR. HARRY L. CLARK (Wayne University): Starting a course of this kind seems to be almost like the young men who are being trained on maneuvers. We have to take our medical students on a trip and put them into the position that they will be in when they are in the field so far as parasitic disease is concerned. The only trouble is that we don't know where they are going and they have to be trained in all of the diseases that they may run into anywhere in the world.

We as a school, up to this time, have been unable to do anything of the kind at all because of the lack of material and thanks to this Association and the Markle Foundation, we have been able to gather material together from all over the world and put it into shape in such a way that these young men are able now to see what they will get in these various places.

Among other things that have been developed has been a method whereby we can mount and keep permanently specimens which we thought previously had to be disposed of immediately after we were through using them for that particular time. This has facilitated making permanent mounts of material which, under ordinary circumstances, we wouldn't be able to give the classes except when we ran on to the specimen, and those of you who have taught this subject for any length of time, know that it is very often impossible to get material when you want it. Again, we feel that we started from nothing and we have something which is well worth looking at. If some of you who have been over to the college and have seen some of the specimens that we have been able to get together there, you are the ones who can appreciate it most. Thank you.

Moving Pictures As an Aid in Pharmacology Teaching

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INTRODUCTION

Although moving pictures have been used for some time to supplement other methods of pharmacology teaching, some re-evaluation might be in order at the present time. Various cinematographic technics have improved radically in the last few years; the use of teaching movies in other fields has sharply increased and, also, there have been some decided shifts of emphasis in the actual content of the regular pharmacology course. Aside from these broader, more permanent changes, the immediate difficulties of performing laboratory work under war-time conditions has increased interest in methods which might be more convenient or, more important, might be more surely available. Any department which is seriously concerned with offering a series of mammalian experiments might be expected to encounter special difficulties at the present time. Animal husbandry in a war center can easily pose some complex problems. It was the prospect of a drastic curtailment in regular mammalian work which directed my interest to this form of reproducing and presenting pharmacologic phenomena. Fortunately, we have not had to compromise the regular content of laboratory work and have, accordingly, used movies in their more proper role, that is, as a basis for introduction and for recapitulation. The background of this topic is briefly reviewed here with a discussion based on our experience with this method as a teaching technic. Some representative references and information sources are included.

NEW CINEMATOGRAPHIC TECHNIQS

The advent of improved, practical color film in 1935 is undoubtedly the most important development in the 16 mm. field since movies were first used in pharmacology.¹ The currently used 16 mm. color film gives remarkable reproduction in original films although copied films still have recognizable but not serious color distortions. Color reproduction is particularly striking in experiments involving exposed organs such as an open chest demonstration of cardiac effects or an open abdomen demonstration of gut movements. Cyanosis and other blood pigment changes are necessarily limited to color reproduction. Some of the earlier medical films in black and white could be reproduced profitably in color. Cinephotomicrography, cinefluorography, stereoscopic movies, animation methods and various endoscopic technics have reached an impressive stage of development and have made possible some medical films of exceptional value. Some of these cinematic methods have not yet been studied at all as regards their application in pharmacology teaching.

1. The author's bibliography is so lengthy that it cannot—because of paper limitations—be included here. It will appear in the reprint of this paper.—Ed.

CURRENT STATUS OF TEACHING FILMS

The present war has emphasized sharply the value of teaching films, particularly in the field of manual technics. An extensive collection of instructional films on almost every conceivable phase of military training and conditioning has been made available to the Armed Services. The Army Signal Corps has been operating a large production studio and has also prepared movies under combat conditions. Air Force films have been prepared at Wright Field. The Medical Department of the Navy has activated four production units for medical motion pictures. The U. S. Office of Education is reported to have sold 30,000 prints of training film whose production began shortly before Pearl Harbor. These covered technics in ship building, aircraft work, machine shop methods, office practice, etc. The War Manpower Commissioner has stated that these new films cut training time by one-third or one-fourth and substantially increased retention of what was taught. These latter films were produced by about twenty-five commercial firms scattered over the country.

In the field of general education, the use of films has increased substantially despite restrictions on production facilities for civilian activities. In this State, for instance, the University Extension Service now distributes about 4,000 teaching films annually from a library of about 700 films, in contrast to the complete lack of any such service in 1938. This degree of expansion is typical.

These developments can be taken to mean that future medical students will have a much higher proportion of this type of teaching as a background. They will be more prepared to use this as a serious tool in the learning process and more inclined to expect it as a part of any modern educational program. It may also be concluded that the termination of the war will leave available greatly expanded production facilities, which might be used in any educational field interested in adapting these methods.

It is of some secondary interest that the value of movies as a pedagogic tool has been critically assayed in the public school by methods which recognize the usual rules of scientific evidence. One group of experiments with about 1,800 students at the ninth grade level indicated that the use of motion pictures increased the material learned in general science courses by about 20 per cent and, further, that retention after three months was increased by about 40 per cent. It was considered that those students taught with the aid of film showed a definite superiority in grasp of relationships. Other studies of the same sort have generally been confirmatory. Discussions by these teachers have emphasized the value of films as "providing concrete background experiences that make lectures more meaningful and interesting" and have decried "attempts to transmit abstractions to pupils in a vacuum" and the "inordinate disposition to traffic in words." Although there is reason to doubt that such studies at this level have much bearing on the conditions of medical school teaching, where the factors of maturity and student interest are quite different, the findings, nevertheless, may have pertinence. Some of the more technical phases of military training have been comparable to the medical school level and the con-

clusions there regarding the effectiveness of movies have been distinctly favorable. A limited experiment on student performance in studying orthopedic surgery showed superiority of movies over other forms of presentation.

MEDICAL SCHOOL USE OF TEACHING FILMS

The use of movies in various medical subjects has been discussed at considerable length. The chief point of interest seems to have been the obvious value in demonstrating surgical technics and there is a general feeling that this application has been over-exploited in comparison with other possible applications. The study of gaits in orthopedics and neurology is another obvious application. The appearance of epileptic seizures has been studied by slow motion methods. The dynamics of obstetric delivery is peculiarly suited to this sort of illustration and some of the first widely used medical movies were of this type. There has been at least one dissenting note from the obstetrics group, to the effect that the entertainment value of movies was something of a distracting factor and that the important part of the movie flashes by so fast the student does not remember it. This commentator preferred still pictures and bas relief sculpture, although movies were used to illustrate the critical position to the artist and for rare operations and procedures.

In pharmacology, it has been proposed that sound lectures be prepared by the most eminent and expert lecturers on each of the regular topics of the course and that these include charts, tables and laboratory demonstrations and be revised from year to year. With ordinary sound film, the costs of such are probably beyond the present budgetary limits of preclinical teaching. With the combination of 35 mm. film strips and recording discs, now being used successfully in the Services, the costs are minimal and these might be used as a preliminary trial method for any program of this sort. There is definitely a trend toward this type of lecture in the field of general education. Possibly there will evolve some optimum ratio between this form of mechanized teaching and the evident value derived from extemporaneous contacts of student and preceptor. In medicine there are already some sound film lectures of this sort, for instance, in pediatrics, and certainly graduate students in pharmacology could gain much from lecture films such as that by John J. Abel, sponsored some years ago by the Chemical Foundation.

TYPES OF FILMS WHICH MAY BE USED IN PHARMACOLOGY

Films which may be used in pharmacology teaching can fall into several categories for purposes of discussion. From the standpoint of cinematic quality, the best films available are those subsidized by the large drug firms and prepared by movie producers specializing in instructional and technical films. Films prepared at the same level of technical quality in the Navy have been estimated to have average production costs in the range of about \$10,000 for each 10 minutes of screen time. (Private producers, however, insist that many acceptable films have been prepared for much less and the U.S.O.E. films have been reported to cost about one-fifth this amount.) Some of these films directly present an important drug specialty and elaborate on its clinical applications;

others briefly show some clinical syndrome and follow with the therapy of that condition. Although developed primarily for clinical audiences and frequently very sketchy or lacking in any phases of pharmacodynamics, occasionally enough attention is devoted to the elucidation of drug actions as to merit consideration in pharmacology teaching. They are chiefly useful because of the conveniently and interestingly presented clinical background for drug therapy. The extent of bias favoring the proprietary specialty of the sponsor varies widely and anything may be expected from outright pressure salesmanship to complete academic detachment. It should be remarked, in passing, that some drug firms, as a simple good will gesture, have subsidized valuable medical films without any direct advertising content. Of the numerous commercially sponsored films, we have come to favor a limited few in teaching; these have included films on sulfonamides, anesthetics, the belladonna group, respiratory stimulants and vitamins. There is good expectation that the number and suitability of such films will improve rapidly after the war but it is doubtful if the direction of their message will be deviated much from the larger clinical audiences and toward the much smaller audience of second year medical students.

Another general class of films is that prepared by professional and semi-professional technics, but sponsored solely by scientific or teaching organizations. The American Medical Association has promoted the production of some excellent films and those on anesthesia, for instance, are of interest in pharmacology. The Eastman silent teaching films have been prepared along good pedagogic lines at the medical school level and by authorities in the various topics covered. The future development of this program under the new sponsorship of *Encyclopedia Britannica* can obviously have considerable influence on medical teaching. It might be hoped that pharmacological subjects, which have not been included previously, will be more fully recognized in subsequent production programs. The Erpi sound films, under the same sponsorship, have been intended for an earlier stage of training and might not normally have been expected to include medical school material such as pharmacology. Various of the larger clinics have prepared films along the lines of their most prominent specialties and numerous individuals or research groups have prepared movies of their research findings which are of expert quality and of such broad significance as to evoke wide interest. A survey of the several hundred available, shows that only a relatively few fall directly in the field of pharmacology, although there is much of related interest.

Another type of film used in pharmacology teaching is that prepared by those engaged in teaching and intended primarily as an aid in their own class-work. Such films usually sacrifice the technical refinements to be obtained with finished professional productions. No department is financially qualified to produce very much film at the rate of \$10,000 per 10 minutes screen time. The basic content of experiments and demonstrations, however, can be adequately reproduced at nominal costs and several departments have been using this method to advantage. The sacrifice of professional cinematic quality is partially com-

compensated for by better possibilities of integration and more individualized selection of points of emphasis. Reproduction of the identical apparatus and local working conditions is a further help in movies intended for introductory purposes. Although this practice may be reasonably satisfactory it is by no means ideal and certainly does not represent an economy of effort. A better arrangement would be one in which a number of departments cooperated and each produced one or a few high quality films on those topics in which they are most specialized. The suggestion that each department contribute one good film a year to a general pool has been put forward recently. An associated suggestion is that some teaching center be put in operation which would specialize in cinematic technics of the sort useful in medical work. The point emphasized in these discussions is that most films being prepared by medical experimenters and teachers are of poor cinematic quality even though some staff members may be competent enough with ordinary photographic methods. A "circuit rider" instructor in the special technics of cinematographic work has also been suggested.

SUITABLE PHARMACOLOGIC SUBJECTS

In considering the type of material best suited for cinematic presentation, several points suggest themselves. Primarily, movies are adapted for reproducing gross kinetic phenomena. Experiments in which the presenting feature is based on changes in quantitative chemistry, temperature, kymograph records, EKG records, etc., are not especially suitable. These make up a substantial portion of the regular pharmacology laboratory work. The reproduction of charts, tables and diagrams is frequently done in movies but is not efficient nor particularly effective. Animated diagrams which present statistical data are more useful for occasions requiring special emotional emphasis than for instruction at the medical school level. Again, although movies can be used to show the equivalent of many still photographs and satisfactorily show such things as a series of endoscopic views of static material, such uses represent applications in a field which is not necessarily the special province of the movie. Sound effects reproduced from experimental conditions do not appear to have much value in pharmacology teaching. Auditory phenomena associated with pharmacological teaching are evidently infrequent. There is thus no need for the type of movie reproduction which is most costly. Running comments added by the later addition of a sound track to prepared film or the preparation of a synchronized phonograph disc is a much less expensive procedure. The value of accompanying sound, however, is debatable. For certain types of material this "canned lecture" arrangement may be useful. It, however, allows no flexibility during presentation and variations may be desirable if, for instance, the same film is also used with pharmacy, dentistry or nursing classes.

Recognizing the foregoing limitations and considerations, there is, nevertheless, a considerable number of typical dynamic phenomena which have an important place in pharmacology teaching and which can be satisfactorily reproduced by ordinary silent film. Convulsant effects are peculiarly suited to

cinematic reproduction. The qualitative differences in such effects as produced by strychnine, picrotoxin, metrazol and insulin can be effectively illustrated. The classic localization of strychnine action in frogs makes a suitable sequence. The intense cerebral excitation and subsequent depression produced by nicotine in a cat or rabbit can be satisfactorily reproduced.

Antagonisms can be recorded well by movies but may lose some effectiveness since time lapses so often imply, even if no more than subconsciously, a certain degree of cinematic deception. Antagonisms which are rapid enough to take place during the filming of a single scene manage to avoid such suggestion. The use of intravenous barbiturates as antagonists to convulsant drugs can fall in this category as does also the antidoting of curare with physostigmine and of magnesium with calcium. The antidoting of cyanide in dogs with nitrite and thiosulfate is somewhat slower and calls for time lapses although it is both dramatic and instructive.

The period of action of barbiturates, being probably their most significant point of distinction, may be shown well in dogs. Time lapses are necessarily involved but the order of recovery appears genuine when all dogs are shown in each scene and the emphasis is clear when the dog with pentothal recovers in less than an hour and the dog with phenobarbital only after several days, with the other barbiturates acting for intermediate periods. The order of recovery is known and can be indicated by arranging the dogs in order of their anticipated recovery. Hyperactive cord reflexes obtained in dogs with morphine and codeine can be illustrated as contrasting with the effects of the barbiturates shown before. The classic illustration of species differences as usually shown with the morphinized cat is good photographic material. Cocaine excitation in the dog can be photographed in the same way and affords an opportunity for comparing the slightly different effects of procaine. Dogs premedicated with barbiturates and with the epinephrine "chemical tourniquet" show respectively the moderately and markedly reduced excitation effects. The ataxia and characteristic expression produced in dogs by cannabis shows typically in movies; the visual startle reflex obtained by sharply waving a hand in the line of vision is a characteristic effect of this drug which can be included.

The excitation state, photophobia, and dry mouth produced by atropine in dogs is also typically shown in movies and may be suitably accompanied by pilocarpine and physostigmine poisoning in dogs. The fibrillary tremors with physostigmine is one of the peculiarly appropriate subjects for movie recording. The preparation of gut fistulae in dogs, the usual arrangements for recording intra-luminal pressures and the production of typical tracings as with atropine and morphine derivatives makes an appropriate topic. The experiment of delayed propulsion time as produced by morphine is capable of demonstration, particularly with the help of animation. Open abdomen observations of gut changes when recorded by movies give every observer the advantage of a favorable view.

Some effects are dependent on the use of color, as the cyanosis occurring during anaphylactic shock in the guinea pig and during aniline-produced methemo-

globinemia in the dog. This last, along with an example of monoxide poisoning, can be elaborated in color movies by showing contrasting blood samples, their distinctions when treated with reagents and their characteristic spectra as obtained by reproduction of text-book plates. Color is also helpful in demonstrations of cardiac dynamics, particularly in open chest preparations. The Hirschfelder-Cushny experiment of auricular fibrillation artificially produced before and after digitalization and the resulting ectopics and ventricular fibrillation with digitalis overdosage are uniquely suitable for color movies. Stereoscopic reproduction would contribute to the value of the final results. A very desirable objective would be the preparation of a comprehensive film covering the pharmacodynamics of digitalis and quinidine, followed by clinical applications and supported throughout by animated drawings.

A variation of this type of subject is one which portrays technics primarily for the purpose of improving student performance. Examples are methods of injecting drugs in the usual laboratory animals; arrangements for recording blood pressure and respiration; preparations of the isolated heart for recording drug responses.

Most of the topics mentioned here have been reproduced in an experimental way from our own class exercises; the enumeration should readily suggest other topics which can be adapted from regular class work. There is certainly no scarcity of suitable material for any contemplated program of professional productions. This is particularly true when it is considered that the foregoing represents merely one type of material which can be effectively used. These, for instance, are experiments which can be routinely performed in regular student work and their reproduction by films is valuable chiefly for introductory or reinforcement purposes. Such films should not substantially decrease the amount of regular laboratory work. There is no good substitute for the actual experience of administering drugs, directly observing their characteristic effects, recognizing biological variations in drug responses and meeting emergencies as they develop. Movies can support this experience but should not displace it as a part of the medical training. With pharmacy, dentistry, or nursing classes, films of this sort may be used more properly as a substitute for laboratory work, which in these cases is not ordinarily as extensive as with medical classes and where interest is often more of a problem.

In addition to the foregoing, another distinctly different type of subject merits consideration, that is, movies which can be used to extend the visual experience of students beyond those of the routine laboratory program. More advanced experiments can be presented which are directly related to those already performed. In the same way, movies afford a means of conveniently presenting some of the clinical syndromes most frequently discussed in pharmacology; many such have been and will be prepared but most of them could be much more effectively integrated with pharmacology teaching if specifically prepared with emphasis on those clinical features which are altered by drug therapy.

ORGANIZATION OF INFORMATION

The emphasis in most recent discussions of medical movies is to the effect that serious efforts should be made to facilitate cooperative effort. To quote one opinion "a chaos of decentralization is preventing the effective use of medical motion picture films." A coordination of distribution is desirable but is not as necessary at the present time as a plan for centralization of information. Several agencies are operating services for loan or sale of medical film. Most of the large drug firms maintain a film library bearing both on their specialties and on general topics. All of these collections are small in comparison with the considerable number of acceptable medical films which are available from the large number of scattered sources. A real service would be performed if all available films were appraised and described from the viewpoint of their usefulness in pharmacology teaching.

Organized information is available in the field of general education. Several publications give comprehensive listings of available films, their specifications and critical abstracts discussing suitability for specific teaching purposes. The film distributing services now operated by many state universities provide catalogs of this sort. In medicine, the most complete listing is that prepared annually by the American College of Surgeons. This now includes about 700 films with specifications but without abstracts. Some of the listed films are of interest in pharmacology and this is particularly true of those falling in the "general" classification. The American Film Center, Section on Health and Medical Films, has prepared critical reviews of films shown at some of the recent medical conventions. In the fields of microbiology and of anatomy critical abstracts are currently prepared by officially designated committees. A similar service in pharmacology would seem both practical and desirable.

Autopsies with Limited Personnel: Use of a Voicewriter

R. H. RIGDON AND HOWARD SCHWANDER

Department of Pathology, University of Arkansas, School of Medicine
Little Rock, Arkansas

The decrease in personnel for teaching pathology has produced many administrative problems. No doubt the department of pathology in every medical school has encountered many of these. To solve one of the problems with regard to autopsies here at the medical school we have found the use of a voicewriter of considerable help.

The standard type of recording apparatus such as an ediphone or dictaphone cannot be used to the maximum advantage in the recording of the autopsy at the time of its performance. This is due to the fact that both hands are occupied with the performance of the examination. Furthermore, it is impracticable to handle any equipment since the hands are soiled. We have not been able to overcome these mechanical difficulties so that our departmental dictaphones could be used in the autopsy room.

A voicewriter seemed to offer a solution to many of the above difficulties. This instrument was obtained on priority. It was installed so that the mouth-piece was placed above the autopsy table at such a level to be convenient for the operator. The control was placed on the floor beneath the table. It was necessary to add an extension to the standard cord in order to place the control in the desired position. The instrument was put at the end of the autopsy table with the recording cylinder in such a position that the operator could conveniently observe it at all times. A cabinet was built to house the instrument because of its proximity to the autopsy table. (Fig. 1.)

It is often necessary for one member of the pathology staff to perform several autopsies during one night or over a weekend. It is impossible for any pathologist to adequately and accurately record his findings without consuming considerable time between cases. The recording of multiple autopsies after the lapse of several hours is undesirable. We overcome this by the use of the voicewriter, dictating our cases as the operation proceeds. When the autopsy is completed the gross description is finished. This procedure definitely increases the accuracy of the description, as nothing is left to memory. The time necessary to perform and to record an autopsy is definitely decreased. Some members of the department estimate that they saved at least 50 per cent of the time formerly required to record an autopsy. The time used for recording does not increase significantly the time required to perform an autopsy. It is the consensus of the staff that, at a minimum, 30 per cent of their time is saved in the performance and the recording of an autopsy.

The students assisting and others attending the autopsy hear the description by the staff member. This does not conflict with the student's description of the pathological changes. On the contrary, the student benefits by hearing an adequate description of the case by an experienced pathologist.

A summary of all autopsies is recorded by the head of the department at the weekly conference. The time of a secretary is conserved since the interval be-

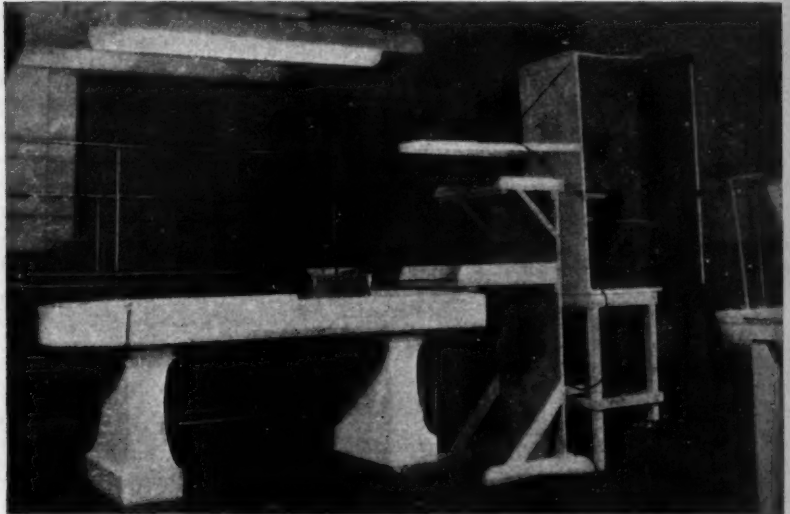


FIGURE 1.—Autopsy table with Voicewriter—A. Mouth piece, B. Foot control, C. Voicewriter cabinet.

tween the dictation of the cases may be considerable. Furthermore, with only one available secretary the office routine is not interrupted.

We would like to emphasize the benefits from the use of this instrument. Other similar types of recording apparatus no doubt would serve the same purpose as the Voicewriter.*

* Made by Thomas A. Edison, Inc., West Orange, New Jersey.

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Maurice H. Rees

It is with a feeling of the most profound shock that we announce the sudden death from coronary disease on May 25th of Maurice H. Rees. Dr. Rees was for many years a valuable and highly esteemed member of the Executive Council of the Association of American Medical Colleges. In 1930-1931 he was president of the Association. He has been dean of the University of Colorado School of Medicine and superintendent of the University Hospitals for many years. He joined the faculty of the school as professor of pharmacology and physiology when it was still only a two year school located in Boulder. The Association was close to his heart. Its affairs were his personal affairs. His counsel was at all times wise and in the best interests of the Association. He was not only outstanding in the field of medical education, but he was also a good friend. One could always count on Maurice Rees saying and doing the right thing. He was not demonstrative. He was quiet, honest and sincere. His passing is not only a shock but it is a great loss to all who knew him and worked with him.

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The Veteran Medical Officer

Any medical officer whose education was interrupted by service with the armed forces is entitled to the benefits of the G. I. Bill of Rights according to the Veterans Administration. If he graduated at the age of 25, served a nine months internship, he will be eligible to accept a residency and receive the emoluments stipulated in the G. I. Bill of Rights. Furthermore, if under that Bill he receives \$500 to pay for his

tuition, he may spend it as he sees fit, in one month, in two months or over a longer period of time. Therefore, if he wishes to take a refresher course of short duration, he can spend the allotted \$500 to pay for that course even if it be of only two weeks duration. The interpretations made by the authorities of the Veterans Administration of the veterans' rights under this bill are very liberal. Veterans are advised to get a ruling on their case before taking any action.

* *

The Ellender Bill

A hearing was held on the Ellender Bill May 1, 1945. The War Department, the Navy Department and Selective Service voiced strong opposition to the bill. The Surgeons General of the Army, the Navy and the Public Health Service approved of the bill. Seventy-seven medical schools wired their approval of the bill. Only one school expressed opposition to the bill. At the time of this writing, it is very doubtful that the bill will pass. It is still before the Senate Military Affairs Committee. That committee has met several times since the hearing on the bill but because of lack of a quorum was unable to transact any business, therefore the Ellender Bill was not considered further. The author of the bill, Senator Ellender, does not feel that the situation is a hopeless one.

On May 31, four representatives of a subcommittee of the Committee on Post-war Medical Services were given the opportunity to discuss the reason for the introduction of the Ellender Bill, namely, the impending shortage of medical students in 1946, with the President of the United States, Mr. Harry S.

Truman. The personnel of this sub-committee was: Dr. Harvey Stone, vice chairman of the Procurement and Assignment Service, Dr. Evarts Graham, professor of surgery, Washington University, Dr. Victor Johnson, secretary, Council on Medical Education and Hospitals, American Medical Association and Dr. Fred C. Zaffke, secretary, Association of American Medical Colleges.

The President listened very attentively to the story the committee had to tell about the supply of medical students in 1946, asked some questions, and finally requested that he be given a summary of what had been said so that he could study the matter at his leisure. This summary was prepared immediately and is now in the hands of the President. Every effort was made by the committee to impress the President with the fact that interest in the matter is centered entirely in a desire to supply the needed number of physicians to conserve the health of the Nation, to supply the Armed Forces, the Veterans Administration and all other agencies needing medical personnel such as, for instance, the military governments in the liberated countries of Europe. Medical schools do not have any vested interest in the problem. They want to give service, do what they can to ensure an adequate supply of well educated medical personnel. Medical schools have been under a severe strain for several years. The accelerated course, a badly depleted teaching personnel and many other factors are actually an invitation to a period of rest—say of one academic year—during which time some badly needed faculty members may have been released from service and be ready to take on their teaching duties and give some relief to the men who have worked hard and faithfully during the emergency. But the great need for physicians supercedes everything else. Medical schools will carry on as they have if they can get students. Right now it seems that that wish is wholly "wishful thinking."

Release of Essential Faculty Members from War Service

The Conferences held recently with members of the staff of Surgeon General of the U. S. Army disclosed that it is definitely planned to release medical officers from service to meet the needs of the medical schools. But no releases can be made until some time toward the latter part of 1945. It is possible that some releases may be made the latter part of September. This is due to the fact that the peak of the activities of this department will not be reached until the fall. The lists of essential faculty members submitted by the colleges are in the hands of the Division of Personnel as are also the lists submitted to the Surgeon General in response to his special request. Medical schools may rest assured that every attention possible is being paid to their request for release of needed personnel.

A release by the Office of the Surgeon General, No. 21, dated May 31, 1945, says:

In formulating the policy consideration was given to civilian needs for professional medical, dental and veterinary care without weakening military needs. Other factors considered were the length of time necessary for personnel to complete their work in the Mediterranean and European theaters and return to the United States; replacement of Medical Department personnel in active theaters by those who have not had overseas duty; necessity for the maintenance of a high standard of medical care; the heavy load of patients in the United States; evacuation of the sick and wounded from Europe in the next ninety days and continuing medical service in the Pacific.

So far as officers in the Medical Corps are concerned, the release says:

(a) Officers whose services are essential to military necessity will not be separated from the service.

(b) Officers above 50 years of age whose specialist qualifications are not needed within the Army will receive a high preferential priority for release from active duty.

(c) Adjusted Service Ratings will be utilized as a definite guide to determining those who are to be separated.

Medical Administrative Corps:

(a) Officers whose services are essential to military necessity will not be separated.

(b) Officers who express a desire to stay on duty shall be allowed to do so if vacancies exist. In the event there are more wishing to stay than there are vacancies, those with the highest efficiency index will be retained.

(c) Those who wish to be released will be selected on the basis of Adjusted Service Scores.

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Medical Officers as Residents

A plan has been considered by the Executive Council which would give hospitals residents assigned by the Surgeon General of the Army. The plan met with the approval of the Executive Council and will be submitted for consideration to the Surgeon General. It is in line with other plans under consideration by the Surgeon General to give medical officers an opportunity to continue interrupted education and to prepare for certification by the specialty boards. Briefly, it is as follows: Instead of advancing an intern to a residency status, the medical school concerned and the hospital agree to receive as a resident an officer assigned to that duty by the Surgeon General. He will not be a discharged medical officer. His term of service will be not less than nine months and may extend to a full three years if the officer is desirous of qualifying for a specialty. These men will be assigned to any and all specialties in medicine. The medical school and the hospital will not be obligated to displace all interns from residencies. They may elect to accept as many medical officers as they wish and they will be given the privilege to select men who are graduates of their own school, if any are available, or men

who have served with them as interns prior to entering on military service. The medical officer will also have the privilege of selection so far as that is possible. Thus, the medical education of the officer will be continued under the most favorable circumstances; the hospital will get a resident who has seen military service and will, no doubt, be a better resident than the man who has not seen service. The intern, in turn, will be assigned to military service at once on the completion of his internship. He can take up a residency, if he wishes, when he has had military service. The transaction will be an exchange which should prove advantageous to all concerned. Medical schools and hospitals are urged to give careful consideration to the plan.

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State Board Statistics

The State Board Number of the *Journal of the American Medical Association*, May 12, presents the annual review of the results of licensure examinations in the states and territories and possessions of the United States. Twenty-two medical schools did not have any failures; eight schools had from 10.0 to 22.0 per cent failures, the latter representing 11 examinees. Twenty-seven out of 50 boards reporting did not fail a single examinee. New York reported the largest number of failures, even excluding failures among graduates of foreign medical schools of whom more failed than passed. The largest number of failures among graduates of unapproved medical schools is reported by Massachusetts, second by Ohio, third by Illinois. The number of examinees involved in the failures reported for the eight medical schools with 10 or more per cent of failures was only 50. Furthermore, it is not possible to tell from the data given how often one graduate may have failed before several examining boards. The study gives a fine over-all picture of the whole licensing situation in the United States.

Uniform Application Blank for Internship

The following blank has been prepared by a committee representing the Association of American Medical Colleges, the American Hospital Association, the Catholic Hospital Association and the American Protestant Hospital Association.

ATTACH PHOTOGRAPH

(Name and Address of Hospital)

APPLICATION FOR INTERNSHIP FROM.....TO.....194.....

NAME.....Date of birth.....

Address (Home).....Birthplace.....

Address (Present).....Sex.....Race.....

Marital state.....Citizenship.....Religion.....

Dependents

State of health.....

Present and previous military service.....

Premedical college.....Year completed.....

Degree or number of years college preparation.....

Advanced work and degree.....

Medical school.....Name of dean.....

Graduation dateDegree.....

Does school require internship before awarding M.D. degree?.....

National Board and State Board examinations—dates taken and results:.....

Membership in organizations (professional and others).....

Practical and hospital experience.....

References

Remarks

Date.....Signed.....

This application should be submitted in accordance with the following principles established jointly by the Association of American Medical Colleges, American Medical Association, American Hospital Association, American Protestant Hospital Association, and Catholic Hospital Association of the United States and Canada:

1. Students should refrain from filing applications and hospitals should refrain from considering applications for internships until after the student has completed the work of the junior year in medical school.
2. Student records should not be released by medical schools in support of applications for intern appointment until after the end of the junior year. This restriction in sending information to hospitals includes letters of recommendation, summaries of scholastic records from the Dean's offices, transcripts of records and recommendations of college faculties.
3. Medical school teaching staffs should very carefully refrain from conversations with their clinical colleagues which may be interpreted as promises of internship appointment.
4. Appointments to internships should not be made until hospitals have received recommendations and credentials covering the first three academic years of medical school work (after completion of the junior year).
5. An interval of ten days is approved for acceptance or rejection of an internship after the student applicant receives the note of acceptance from the hospital.

College News

University of Texas School of Medicine

The University of Texas Medical Branch chapter of Alpha Omega Alpha held its annual initiation and banquet for new members on June 1 in Galveston. The speaker was Brigadier General E. G. Reinartz, Commandant of the School of Aviation Medicine, Randolph Field, Texas. General Reinartz also delivered the annual Alpha Omega Alpha Lecture before the students on June 1.

The second annual Child Health Conference under the auspices of the Department of Pediatrics of the University of Texas School of Medicine was held recently in Galveston with pediatricians in attendance from all parts of Texas and with Army medical officers as special guests. Among those who conducted the clinics at the Conference were Dr. Irvine McQuarrie, professor of pediatrics at the University of Minnesota, Dr. William L. Bradford, associate professor of pediatrics at the University of Rochester Medical School, Dr. Herbert Miller, associate professor of pediatrics at Yale Medical School, and Dr. Wallace Sako, associate professor of pediatrics at Louisiana State University, New Orleans. Members of the clinical staff of the University of Texas School of Medicine participated in the Conference.

Dean William H. Moursund of Baylor University College of Medicine, Houston, was the speaker at the graduation exercises June 2nd.

The National Research Council has given a grant to Dr. Thurlo B. Thomas of the Anatomical Laboratory for studies on the action of alloxan.

Speakers at the recent postgraduate session of the Army Air Force Regional Hospital, San Antonio Aviation Cadet Center, included Dr. Rene DuBos of the Rockefeller Institute, Dean Tinsley Harrison of the Southwestern Medical College, Dallas, Dean Chauncey D.

Leake and Lt. Colonel Roy G. Grinker.

The Legislature of the State of Texas has unanimously authorized the transfer of the Galveston State Psychopathic Hospital from the State Board of Control to the Board of Regents of the University of Texas to be operated as a part of the Medical Branch. Formerly accommodating approximately 80 patients, the institution will be re-equipped to handle about 120 patients for rapid diagnosis and rapid treatment. Special facilities will be provided for postgraduate training in neuropsychiatry and for psychiatric nurse training. The Director is Dr. Jack Ewalt, Professor of Neuropsychiatry. The hospital will not be ready to receive patients until refurnishing and reorganization have been completed.

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University of Illinois College of Medicine

The College of Medicine announces its sixth semi-annual refresher course in laryngology, rhinology and otology, September 24-29, 1945. The course is intensive and largely didactic, but some clinical instruction is also provided. It is especially suited to specialists unable to devote a longer period for advanced instruction and to others seeking a comprehensive review of the field of otorhinolaryngology. The number of registrants will be limited. It is therefore desirable to apply for registration immediately. The fee is \$50. When applying, give full details as to school and year of graduation, postgraduate training, college degrees, etc. Write to Dr. A. R. Hollender, Chairman, Refresher Course Committee, Department of Otolaryngology, University of Illinois College of Medicine, 1853 West Polk Street, Chicago 12, Illinois.

A plan has been set up for a three months basic course in medicine, primarily for general practitioners, especially

those who intend to practice in non-metropolitan areas, small communities and rural districts. Registration will be limited to an optimum number of 30 and a maximum of 40 with a minimum quota of 15 to be met before the course is offered. Veteran medical officers will be given preference. The tuition fee will be \$75 for residents of Illinois and \$100 for nonresidents. Opportunities for advanced study in special fields will be available to applicants whose previous training indicates qualification for study in special fields and who are not undertaking further residency training. Fees will vary according to course but will not be in excess of \$75 for residents and \$100 for nonresidents. Graduate courses in the fundamental basic science fields will also be available. Residencies in several clinical specialty fields are offered as well as a limited number of research fellowships which will carry an annual stipend of \$1,200. Further information will be given by the Dean of the college.

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*Stanford University
School of Medicine*

The school has received a total of 89 gifts aggregating \$34,179 in the past 12 weeks, it was announced today by Dr. Donald B. Tresidder, president. Among the gifts were \$5,000 from Mrs. Francis I. Proctor of Santa Fe, N. M., to be used in support of an ophthalmological laboratory in memory of her husband; \$2,000 from the Phelan Fund for the Comfort of Hospital Patients to be used for alterations in the "outpatient" department of Stanford clinics; \$1,000 from Hugh Rose of Mexico City to be added to the Bloomfield Laboratory Fund; \$1,000 from Mrs. Harold K. Faber of San Francisco to be added to the Harold K. and Mary K. Faber Free Bed Fund; \$900 from the Briggs Estate to be added to the Wallace A. Briggs Free Bed Fund; \$700 from the Poso Land and Products Company of Fresno to be added to the Tumor Clinic Fund.

Research grants were as follows: \$11,100 from the National Foundation

for Infantile Paralysis for research in physical therapy and for an epidemic aid unit; \$5,416.66 from an anonymous donor for pharmacology research by Dr. Paul J. Hanzlik; \$921.73 from the Commonwealth Fund for the pediatric-psychiatric unit; \$750 from the Winthrop Chemical Company, as one-half payment on an annual \$1,500 fellowship in pharmacology.

Dr. L. R. Chandler, dean, has been appointed a member of the National Board of Medical Examiners to succeed the late Dr. Maurice H. Rees. Dr. Chandler will represent the Association of American Medical Colleges on the Board.

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*University of Wisconsin
Medical School*

The faculty held a special program May 15-16 to mark the retirement of Drs. Charles H. Bunting, professor of pathology, and Joseph S. Evans, professor of medicine, University of Wisconsin Medical School. Dr. Bunting was the first professor of pathology at the medical school, joining the university in 1908; he is also chairman of the department. Dr. Evans, who began his affiliation in 1909, was the school's first professor of medicine. He is also chairman of the department. As a special feature of the program, Dr. Eugene L. Opie of the Rockefeller Institute for Medical Research, New York, spoke on "Production Tumors, with Special Reference to Hepatic Tumors Produced by Feeding Azo Compounds" and "Significant Questions Concerning Transmission and Epidemiology of Tuberculosis."

* *

*Bowman Gray
School of Medicine*

Construction on the new Outpatient Department Building is well under way. It is expected that it will be completed within approximately three months. When completed it will provide accommodations for 45,000 patients per year. The total cost, including equipment, will be \$250,000. Dr. Robert W. Lackey,

professor of physiology, Southwestern Medical School, is serving as visiting professor of physiology during the present trimester. Dr. J. E. Hawkins, Jr., a member of the department of physiology, Harvard Medical School, has been elected assistant professor of physiology. Graduation exercises were held June 17, 1945. Forty-six seniors received the degree of Doctor of Medicine. Dr. J. Allen Easley, professor of religion, Wake Forest College, delivered the commencement sermon, and Honorable Clyde R. Hoey, United States Senator from North Carolina, delivered the commencement address. The Dean's report for the four-year period that the medical school has operated as a four-year institution reveals that the faculty has contributed to the literature 187 publications. Total grants for the period amount to \$127,770.

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*Wayne University
College of Medicine*

Dr. David D. Henry, vice president of Wayne University, will succeed the late Dr. Bow as president and will devote all of his time to this appointment.

Acceptance of gifts totalling \$15,657 was approved by the Board of Education. Included was a grant of \$7,557 from the Federal Office of Scientific Research and Development to be used for the study of contaminated wounds, protein metabolism, and sodium lactate; a gift of \$5,000 from the Griffith Laboratories, Chicago, for a two-year study of antioxidants; another of \$2,000 from the Children's Fund of Michigan for continuation of the work on the brain disease registry; a grant of \$1,000 from O. C. Frohnecht to finance research on multiple sclerosis; and the sum of \$100 from Dr. James D. Bruce, of Ann Arbor, for the continuation of the Theodore A. McGraw Scholarship.

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*University of Georgia
School of Medicine*

An expansion of the clinical facilities of the school has been advocated by a

survey committee appointed by the Governor of Georgia. An expenditure of about \$1,000,000 will make it possible to do this. The plan includes the erection of a state hospital in Augusta, a new administration building,—the present building to be converted into a dormitory,—and building smaller state hospitals in certain sections of the state. The number of full time clinical instructors will be increased to meet the needs. Senior students may be compelled to intern in one of these hospitals, thus lengthening the course to five years, the fifth or hospital year being under the direction and supervision of the medical school.

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*University of Tennessee
College of Medicine*

The speaker at the March commencement was Lt. Col. James B. Brown, M.C., chief of plastic surgery, Valley Forge Hospital. His subject was "Investment in Personality."

Dr. S. R. Bruesch, assistant professor of anatomy, is on leave-of-absence to work with Dr. Curt P. Richter at the Psychobiological Laboratory of the Phipps Psychiatric Institute, Johns Hopkins Hospital. Dr. James O. Brown, associate professor of anatomy and acting head of the department of anatomy, Woman's Medical College, will be a visiting associate professor of anatomy at Tennessee for the summer quarter.

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*University of Colorado
School of Medicine*

Dr. Maurice H. Rees, dean, died suddenly May 25th from coronary occlusion.

Dr. James B. McNaught, associate professor of pathology, Stanford University School of Medicine, has been appointed professor and head of the department of pathology, effective August 1.

Dr. Ward Darley, associate professor of medicine, has been appointed acting dean and superintendent of university hospitals to succeed the late Dr. Maurice H. Rees.

Woman's Medical College

The college opened the Mary Dern Goodrich Auditorium May 1st. The redecoration of the room and its equipment for motion picture and sound projection are the gifts of Mr. William Goldman of Philadelphia. Judge Herbert F. Goodrich, President of the College, for whose wife the auditorium is named, thanked the donor in the name of the college. Dr. William G. Leaman, Jr., professor of medicine, showed the first and the latest medical films taken at the college and discussed the value of the motion picture in medical education.

* *

*Cornell University
Medical College*

On May 18, Secretary of War Henry L. Stimson, presented to the college a portrait of his father, the late Dr. Lewis Atterbury Stimson, the first professor of surgery at Cornell, in whose memory a chair of surgery has been established. The chair is endowed by Miss Candace Stimson, Dr. Stimson's daughter. More than \$600,000 is available for the endowment. The first occupant of the chair will be Dr. George J. Heuer, professor of surgery at Cornell.

* *

*University of Virginia
Department of Medicine*

Dr. Peyton Rous of the Rockefeller Institute of Medical Research delivered the second of the annual Sigma Xi lectures. He spoke on the cancer problem. The Alpha Omega Alpha chapter initiated three new members May 11th. Dr. Franklin M. Hanger, associate professor of medicine, Columbia University, spoke on "Recent Advances in the Study of Hepatitis."

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*University of Pittsburgh
School of Medicine*

Dr. John R. Murlin, Ross Professor of Physiology and Director Emeritus of the Department of Vital Economics at

the University of Rochester, delivered, on May 16, the 28th Mellon Lecture of the Society for Biological Research of the School of Medicine, University of Pittsburgh. His subject was "Biological Value of Proteins in Relation to the Essential Amino Acids."

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*University of North Dakota
Medical Center*

The Legislature has passed a bill establishing a medical center at the University of North Dakota. The bill enables the university to accept federal grants or donations from private agencies. Sponsors of the bill claim that it will make possible a four year medical course and expansion of the state's health and welfare services.

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*University of South Dakota
School of Medicine*

The Legislature has appropriated funds to expand the present two-year school of medicine to a four-year school. The site of the school has not been chosen but it is probable that it will be Sioux Falls. Other cities in the state may be brought into the picture as clinical teaching centers if needed to set up an adequate clinical teaching program.

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*Emory University
School of Medicine*

Dr. Russell H. Oppenheimer has resigned as dean effective June 1, after nearly twenty years of service. After a leave of absence he will resume his duties as professor of medicine. Dr. Eugene A. Stead, Jr., professor of medicine, will serve as acting dean. A dinner was given by the faculty in honor of Dr. Oppenheimer on June 11.

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*University of Maryland
School of Medicine*

The department of pharmacology has received a grant of \$1,000 from Hynson, Wescott & Dunning to defray cost of research.

*University of Cincinnati
College of Medicine*

Dr. Edward Fall Malone, professor of anatomy, will retire, effective July 1, at his own request because of ill health. He joined the staff of the University of Cincinnati in 1910 as assistant professor of anatomy; in 1918 he was made professor of histology and in 1925 Francis Brunning professor of anatomy and director of the department. His successor has not been announced.

♦ ♦

*University of Buffalo
School of Medicine*

Plans are being made for the centennial celebration of the founding of the University of Buffalo of which the Department of Medicine was the first unit. A campaign will be made to collect funds for the erection of a new medical school building on a site to be selected later.

♦ ♦

*University of Oklahoma
School of Medicine*

Dr. Hubert E. Doudna, professor of clinical anesthesiology, has been granted leave of absence to go on active duty with the U. S. Navy. Dr. Chas. R. Rayburn, professor of mental diseases, has been released by the Army and will resume his work in the school.

♦ ♦

Medical College of Alabama

The Alabama Division of the Field Army of the American Cancer Society has presented to the college a set of 100 microscopic slides for study of cancer and other tumors. The slides were purchased from the Central Bureau for the Study of Tumors in Philadelphia.

♦ ♦

*Columbia University
College of Physicians and Surgeons*

Dr. Harry P. Smith, professor of pathology, State University of Iowa College of Medicine, has been appointed professor of pathology and executive officer of the department of pathology.

*Northwestern University
Medical School*

Dr. John Gordon Wilson, professor and chairman of the department of otolaryngology since 1908, retired in April. Dr. Howard C. Ballenger, associate professor in the department, is now acting chairman.

♦ ♦

*Boston University
School of Medicine*

Dr. Alice S. Woodman, associate professor of histology and embryology, a graduate of Boston University in 1903, a member of the faculty for 38 years—since 1907, will retire June 30. She was given a rousing ovation by both students and faculty in May.

♦ ♦

Jefferson Medical College

Dr. Abraham Cantarow has been appointed professor of physiological chemistry, succeeding Dr. George R. Bancroft, who retired at the end of the present academic year in June. Dr. Cantarow has been a member of the Jefferson faculty since 1927.

♦ ♦

*Yale University
School of Medicine*

Dr. W. W. Peter has resigned as associate professor of public health to become director of the training division of the Institute of Inter-American Affairs in Washington.

♦ ♦

*University of Rochester
School of Medicine*

Dr. Basil C. MacLean, director of Strong Memorial Hospital, has been appointed to the newly created position of professor of hospital administration.

♦ ♦

*University of Kansas
School of Medicine*

Dr. Paul G. Rooft, Ph. D., assistant professor of anatomy, University of Louisville, has been appointed professor and chairman of the department of anatomy, effective September 1.

General News

Passano Foundation

As the result of a nationwide poll among leaders in medical science, Dr. Edwin J. Cohn, professor of biochemistry at Harvard University, has been chosen as the first winner of the Passano Foundation award. Presentation of the \$5,000 cash award will be made in Osler Hall of the Medical and Chirurgical Faculty of Maryland, Baltimore, May 16th. Dr. Cohn is distinguished for his work on the fractionation of blood.

The Foundation, which was established in 1944 by the Williams and Wilkins Company, Medical Publishers, of Baltimore, proposes to aid in any way possible the advancement of medical research, especially research that bears promise of clinical application. For the encouragement of such research the Foundation has established the award as one of its activities.

Dr. Emil Novak, Associate in Gynecology, Johns Hopkins University Medical School; Dr. Nicholson J. Eastman, Professor of Obstetrics, Johns Hopkins University Medical School; Dr. George W. Corner, Director of the Embryological Laboratory of the Carnegie Institution of Washington, represent the medical profession on the Board of Directors of the Foundation.

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Permanente Foundation Research Fellowships

The Permanente Foundation will offer a limited number of fellowships for clinical research in the fields of medicine, surgery and related specialties. Appointments will be awarded to graduates of recognized medical schools who have completed an approved internship. A limited number of fellowships will also

be available to qualified physicians who present a suitable research problem of their own choosing. A detailed outline of the investigational study which the applicant desires to undertake should be presented to the Permanente Fellowship Committee for approval. A thesis covering the year's work will be required at the completion of the fellowship. At the conclusion of the research fellowship, opportunities will be available to men for extension of the fellowship or for positions on the resident or attending staff of the Permanente hospitals. Research fellows will receive \$225 monthly, plus maintenance. Fellowships for the year 1945 in the field of internal medicine will cover cardiac status in pneumonia and the evaluation of recent advances in peptic ulcer therapy. Applications should be addressed to the Chairman, Fellowship Committee, Permanente Foundation Hospital, Broadway and MacArthur Boulevard, Oakland 11, Calif.

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James Ewing Memorial Fund

A fund of \$150,000 will be subscribed to Memorial Hospital for the Treatment of Cancer and Allied Diseases as a memorial to the late Dr. James Ewing, identified with the hospital for many years. Income from the fund will be used to support undergraduate and graduate instruction for students of Cornell University Medical College and at the hospital to finance at least two lectures annually on recent advances in neoplastic diseases and to support such special study as may seem advisable to a supervisory committee. Dr. Elise D. S. L'Esperance, member of the board of managers and director of the Strang Preventive Clinic, is chairman of the fund committee.

Book News

The Story of a Country Medical College

By Frederick Clayton Waite, Vermont Historical Society, Montpelier, Vermont. 1945. Price, \$4.50.

Dr. Waite has done a fine piece of work in collecting the material needed to give a complete history of the Clinical School of Medicine and Vermont Medical College in Woodstock, Vermont, chartered in 1835, founded by Dr. Joseph A. Gallup. The history comprises three parts. The major feature is a narrative giving the general story of the institution with some indications of its relation to medical education of the era in which it existed and to other medical colleges which influenced it. An attempt is made to show the causes and results of more important events in the belief of the author that history is more than the mere recital of annals. The narrative is followed by a series of appendices in which are given some details of information, both in statistics and personnel, which would hamper the theme if inserted in the narrative. Finally is presented a catalog of all recipients of degrees, both earned and honorary, and another catalog of those who attended the institution but did not receive a degree from it. Every one who is interested in the history of medical education will find this work good reading. It represents a great deal of careful research over a long period of time.

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The New-born Infant:

A Manual of Obstetrical Pediatrics

By Emerson L. Stone, M.D., Associate Professor of Obstetrics and Gynecology, Yale University School of Medicine. Ed. 3. Lea & Febiger, Philadelphia. 1945. Price, \$3.25.

This book portrays the problems of neonatal life which are unique in many respects. That interval during which the infant ceases to be of primary obstetrical concern but has not yet become a pediatric charge, is a period of vital importance. There are few textbooks on this subject, and the instruction of medical students does not ordinarily include a course in neonatal physiology and pathology. The author has correlated and arranged in order a mass of data which is otherwise scattered throughout a vast medical literature. He has indicated throughout the obstetrician's advantage and responsibility. This edition, which has been completely revised, reviews the accepted principles and emphasizes practices of proven value. At the same time it incorporates the added knowledge of the past decade in this field.

Dietotherapy:

Clinical Application of Modern Nutrition

Edited by Michael G. Whol, M.D., Associate Professor of Medicine, Temple University School of Medicine; with a Foreword by Russell M. Wilder, M.D., Professor of Medicine, Mayo Foundation. W. B. Saunders Company, Philadelphia. 1945. Price, \$10.

The science of nutrition has not in the past been part of medical discipline. Now, it is coming into its own. Here is presented an authoritative and up-to-date discussion of every aspect of nutrition, in its broadest scope. The contributors are all authorities in their respective fields. The subject is considered in three parts: Part I: Normal Nutrition; Part II: Nutrition in Periods of Physiologic Stress; Part III: Nutrition in Disease. The student and the physician will find this book invaluable in the study and treatment of conditions in which nutrition plays an important role—especially in the maintenance of good health.

♦ ♦

Penicillin and Other Antibiotic Agents

By Wallace E. Herrell, M.D., Assistant Professor of Medicine, the Mayo Foundation. W. B. Saunders Company, Philadelphia. 1945. Price, \$5.

A very complete record of all that is known about this agent based on careful and thorough study and research and a large clinical experience.

♦ ♦

A Textbook of Ophthalmology

By Sanford R. Gifford, M.D., formerly Professor of Ophthalmology, Northwestern University Medical School. Ed. 3. Saunders Company, Philadelphia. 1945. Price, \$4.

Thoroughly revised by the author before his death. This is a fine text for the student as well as for the practitioner. It gives complete coverage of the subject without being voluminous.

♦ ♦

Preventive Medicine

By Mark F. Boyd, M.D., Field Staff Member International Health Division, Rockefeller Foundation. Ed. 7. W. B. Saunders Company, Philadelphia. 1945. Price, \$5.50.

Much new material has been added. Rheumatic fever, leptospirosis and asbestosis are newly introduced. The section on nutrition has been entirely recast in the light of current concepts.

Fundamentals of Pharmacology

By Clinton H. Thienes, M.D., Ph.D., Professor of Pharmacology, University of Southern California School of Medicine. Paul B. Hoeber, Inc. 1945. Price, \$5.75.

Another in the Student Textbook Series. The text features conciseness without omitting material clinically valuable to medical students. The major emphasis is on dynamics of drug action and the absorption, distribution, metabolism and excretion of those drugs which form the major basis of therapeutics. A special section is devoted to prescription writing. The author's long experience as a teacher is reflected in this book. The practitioner will also find it useful and helpful.

* *

Essentials of Body Mechanics in Health and Disease

By Joel E. Goldthwait, Lloyd T. Brown, Loring T. Swaim and John G. Kuhns. With a chapter on the Heart and Circulation as Related to Body Mechanics by William J. Kerr. Ed. 4. J. B. Lippincott Company, Philadelphia. 1945. Price, \$3.

Presenting a new concept of correct body mechanics in maintaining positive health and the application of fundamental principles in the study of patients suffering from chronic disease.

Clinical Pastoral Training

Edited by Seward Hunter. Commission on Religion and Health, Federal Council of the Churches of Christ in America. 1945.

Theological educators have long concerned themselves with the problem of providing seminarians and clergy with instruction and guidance in the more practical aspects of pastoral care. During the past twenty years a program for clinical pastoral training has been developed. This book represents the thinking and the experience of many leaders in the field. It is a most interesting report on what may be termed "spiritual interns," their work, the results of that work; how it correlates with physical care of patients.

* *

The Psychology of Women: A Psychoanalytic Interpretation

By Helene Deutsch, M.D., Associate Psychiatrist, Massachusetts General Hospital. Vol. II. Motherhood. Grune & Stratton, New York. 1945. Price, \$4.50.

This is a fine follow-up of the first volume in this series—"Girlhood." It is based on a large experience and careful study of the psychology of women. It is a real contribution to medical literature and for reading by women generally. It is a milestone in the revelation of feminine personality.

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